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BOOKS RECEIVED

The Atom Clock. By CORNELL LENGYEL. Prize Play Winner of "Maxwell Anderson Award" of 1950 offered by Dramatists' Alliance, Stanford University. Copies may be obtained from Writers Lab, 1459 North Kings Road, Hollywood 46, Calif.

Atomic Energy and the Hydrogen Bomb. By GERALD WENDT. New York: Medill McBride Company, 1950. Pp. 192. $2.75.

Atomic Energy Regulations. Release No. 12. Albany, New York: Matthew Bender and Company, 1950.

Democracy in a World of Tensions. A Symposium prepared by UNESCO. Edited by RICHARD MCKEON. Chicago: University of Chicago Press, 1951. Pp. 540. $4.50.

The H-Bomb. Introduction by ALBERT EINSTEIN. Commentary by GEORGE FIELDING ELIOT. New York: Didier, 1950. Pp. 175. $2.50.

The Hell Bomb. By WILLIAM L. LAURENCE. New York: Alfred Knopf, Inc., 1951. Pp. 198. $2.75.

Industrial and Safety Problems of Nuclear Technology. Edited by MORRIS H. SHAMOS and SIDNEY G. ROTH. New York: Harper & Brothers, 1950. Pp. 368. $4.00.

Mid-Century: The Social Implications of Scientific Progress. New York: John Wiley & Sons, Inc., 1950. Pp. 549. $7.50.

The Oak Ridge Story. By GEORGE O. ROBINSON, JR. Kingsport, Tennessee: Southern Publishers, Inc., 1950. Pp. 181. $3.50.

Religion im Lichte Der Heutigen Naturwissenschaft. By FRIEDRICH DESSAUER. Frankfurt am Main, Germany: Verlag Josef Knecht, 1950. Pp. 49.

The Soldier's Load and the Mobility of a Nation. By COLONEL S. L. A. MARSHALL. Washington: Combat Forces Press, 1950. Pp. 122. $1.00.

Sourcebook on Atomic Energy. By SAMUEL GLASSTONE. New York: D. Van Nostrand Co., 1950. Pp. 546. $2.90.

Witch Hunt: The Revival of Heresy. By CAREY MCWILLIAMS. Boston: Little Brown and Company, 1950. Pp. 361. $3.50.

Editorial

FIVE YEARS AFTER

I

THE first issue of the *Bulletin of the Atomic Scientists* appeared on December 15, 1945. It was born of a combination of gloom and hope. Standing around the first nuclear fire lit under the West Stands of the Athletic Field of the University of Chicago in December 1942, and, two-and-a-half years later, in July 1945, watching the flash of the first atomic bomb explosion at Alamogordo, the scientists had a vision of terrible clarity: They saw the cities of the world, including their own, falling into dust and going up in flames. They saw that human history had but to remain true to the pattern it has followed for thousands of years—a sequence of wars interrupted by brief interludes of peace—for our civilization, which we had heretofore believed to be the first stage of an ultimate and universal civilization of mankind (different—we thought—from the local civilizations of the past, that rose and became stagnant and disintegrated), to end in chaos and destruction, the like of which had not been seen on earth. In the summer of 1945, some of us walked the streets of Chicago vividly imagining the sky suddenly lit by a giant fireball, the steel skeletons of skyscrapers bending into grotesque shapes and their masonry raining into the streets below, until a great cloud of dust rose and settled over the crumbling city.

II

From this vision arose the weak and inadequate attempts that groups of scientists made to stop the hands of the clock before it struck the first hour of the atomic age—the memoranda and petitions, asking that the use of the atomic bomb in the war against Japan be foregone. The news of the Hiroshima strike was a terrible blow to many who had contributed most toward making the atomic bomb possible; the news of the bombing of Nagasaki was received by an even larger group with dismay and gloom. To some of us, it seemed at that time that with this unimaginative and ruthless introduction of atomic energy to mankind, America had initiated a chain of events that would inexorably lead to the same fate visited, sooner or later, upon her own cities, and the cities of Europe.

III

A glimmer of hope appeared in the darkness. Was there not a chance—an off-side chance perhaps, but still a chance—that the fate of Hiroshima and Nagasaki would cause Man to turn a new leaf? Could we not spur this decision by buttonholing all who would listen and preaching to them our message of doom and our precept for survival: live in peace or perish? And did not atomic energy offer an incomparable chance for nations to become partners in a venture into uncharted new fields, instead of eternal competitors for the limited known wealth and power of the earth? The founding of the *Bulletin of the Atomic Scientists* was a part of the conspiracy to preserve our civilization by scaring men into rationality.

How often did we hear at that time that we were dreamers? Men wise in history, or practical politics, or proud of their common sense, told us that wars have always been—and will always be; that national and ideological enmities cannot be made to lapse simply because physicists have found that certain nuclei will fission in a chain reaction. The scientists were supposed to be so naïve politically as to ignore this! They were also accused of not understanding that the Soviet Union is a totalitarian dictatorship, out to convert the world to its ideology, and, if opportunity appears, to conquer those who refuse to be converted; and that it was unrealistic, to say the least, to plan the development of atomic energy as a common enterprise with this dictatorial regime. As if we did not know this, too! It was (and remains) difficult, almost impossible, to convince people that the aims were set, and the fight undertaken, not in idealistic blindness to reality, but in full realization that these aims were *almost* unattainable, and the fight *almost* lost, even before it began. Szilard, in 1945, used to say that the chances of avoiding atomic war with the Soviet Union were between 5 and 10 per cent. Practical men might not be willing to do anything against such odds, but doctors would not give up a patient as long as they could reasonably assume that he had a 5 per cent chance of survival. To double the chance of lasting peace in the first few years; to redouble it a few years later—that was as much as one dared to hope for in 1945. To a rational mind—and the scientific mind must try to remain rational even when dealing with the emotion-laden facts of social and international politics—it was clear at that time that overwhelming historical probability pointed to a new power contest, to be waged between the victors in the contest just won against Germany. The fact that one of the victors was a ruthless, totalitarian state, founded on a belief in the wickedness of the "capitalist" world outside its borders, and the inevitability of a mortal conflict with this world, made it obvious that to avoid the traditional clash between victorious allies would be even more difficult this time than in the past. The threat of atomic destruction, if not banished by some immediate settlement, was bound to make the contest more bitter and irrational than ever.

We knew all this, and yet we have tried to work against the all but inevitable trend, because we saw only too clearly what the consequence of letting this trend take its course would be. As time went on, the odds against success grew higher and higher. What was most likely to happen, happened. Men of common sense and of practical politics can be satisfied; the patient is steadily getting worse.

IV

United States foreign policy did not try to put a stop to the development of the power contest with the Soviet Union right at its beginning. Not realizing the magnitude of the threat that

such a contest with the totalitarian system, dominating the continents of Europe and Asia, would create for the very survival of American democracy; unmindful—although forewarned—of the peculiar danger of atomic weapons for the urbanized and industrialized countries of the West, American leadership did not then throw the tremendous military and economic weight that America possessed in 1945 into an effort to establish a world political organization able to enforce peace by force, and a world economic system binding all nations in a community of interests—such as was proposed later in the field of atomic energy. America did not offer the Soviet Union generous help in the reconstruction of its war-torn economy; but neither did she oppose with her full force the subjugation by the Soviet Union of the nations of Eastern Europe. Instead, the U.S. government canceled lend-lease, conveniently "mislaid" the Soviet application for a loan; and, at the same time, disbanded American armies in Europe, dismantled thousands of American planes, and put most American warships in mothballs; thus, in effect, if not in word, it condoned the extinction of democracy and national independence in eight East European nations.

Having accepted the division of the world into two "spheres of influence," America proceeded to set up "no trespassing" signs in what she considered "her side" and to prop up this or that member of the non-Soviet bloc by piecemeal economic or military assistance. So came, on the economic side, the British loan, the ECA, the Point Four program; and, on the military side, the support of the Greek government against communist insurrection, the air-lift to blockaded Berlin, the European rearmament program, and, finally, the U.N.-approved intervention against the aggressor in the civil war in Korea. Whatever success has been achieved by all these moves, was, however, vastly offset by the victory of the Soviet-backed side in the civil war in China.

V

While scientists went around explaining to members of Congress, Elks, Rotary, and Women's Clubs the destructive potentialities of atomic energy; while they watched, first with hope, then with anxiety and, finally, with despair, the proceedings of the United Nations Atomic Energy Commission; while they joined with prominent laymen, educators, and social scientists—and a few politicians who have recognized the emergency—in groups agitating for the reorganization of the world under enforceable international law, the Soviet leaders pursued their power-political aims, as if they still lived in the seventeenth century, and the non-Soviet nations countered by moves of the same kind, if of lesser ruthlessness. The cleavage between the two camps grew deeper, and the few remaining bridges between them were destroyed one after another. Through the accession of China, the Soviet camp established effective domination of the "world island" of the Old World. The peninsulas jutting out of this island—Western Europe, the Arabian countries of the Near East, India, Southeast Asia—while still bound, more or less firmly, to the American camp, were doomed, by their position on the map, to live from now on, in paralyzing dread of Soviet conquest. The American atomic bombs provided Western Europe with a precarious protection—by threatening that any open aggression by the Soviet Union would bring about atomic destruction of the centers of Soviet power. To China, this threat was less of a deterrent than to the more industrialized Soviet Union; and the Chinese Communist leaders showed little hesitation when they dared America and her associates in the United Nations with open intervention in Korea.

VI

As the *Bulletin* enters its sixth year, the break between the two camps appears all but complete. In this situation, the military weakness of the West, revealed by the events in Korea, makes an attempt to correct the unbalance of power, by an all-out rearmament effort, the first and almost the only concern of the nation. The question of how to stop the arms race is set aside while the West struggles with the question of how to stop losing this race. The world problem nearest to the heart of scientists—international control of atomic energy—is now shelved, even if not officially abandoned, because in the absence of sufficient "conventional" land power, America is left with no choice but to rely on her atomic arsenal, first as a deterrent to full-scale war and, second, if this deterrent should fail, as a means to cripple the industrial power of the Soviet Union and gain time for all-out rearmament at home. Only if and when the plans of the Atlantic nations to mobilize, equip, and train enough divisions to stop, if needs be, the Soviet invasion of Western Europe succeed, will America regain the freedom of action that permitted her to offer effective abolition of atomic weapons five years ago. Whether these plans will mature before the Soviet Union (encouraged by the progress of her own atomic armaments plants), might decide on preventive war, is the decisive question which nobody can answer at present with certainty—perhaps not even the Soviet rulers themselves.

The scientists, individually and as a group, are now faced with the grave question of whether to curtail their normal research activities in order to help solve the many immediate and long-range technical problems involved in rearmament. Instead of speaking before mildly interested groups of laymen on international control of atomic energy, they are now called upon to address intensely worried committees on civilian defense against atomic attack.

VII

Scientists—whose profession requires a recognition of facts, however unpleasant—cannot but admit the fact that their campaign has failed. Even in America the success of their educational efforts fell far short of persuading the majority of the nation that with the emergence of atomic weapons the meaning of national security and national sovereignty, national sacrifice and national prosperity, had radically changed. Even more decisive in determining the failure has been the fact that all attempts scientists have made to establish contact with Russian colleagues have been in vain. Several dozen copies of the *Bulletin* regularly go to addresses in the Soviet Union; but we doubt whether any Russian is permitted to read these copies, except agents gathering material for military intelligence or political propaganda.

Was there something American scientists could and should have done—and have left undone? Have they been too sparing in their efforts? Have they been wrong in trying to keep up with their professional work, and—with few exceptions—devoting only a small fraction of their time to the education of American people and their leaders in the "facts of life" of the atomic age? Should they have made less timid attempts to reach their Russian colleagues, enlisting, for this purpose, the public opinion of the free world? Should they have tried to mobilize the intellectuals of Europe and Asia for peace—instead of leaving this mobilization to Soviet agents and communist dupes? What would have been the result if they had adopted some spectac-

ular methods of propaganda through mass action, such as a demonstration strike, or a refusal to do any military work, inviting scientists everywhere—in Russia particularly—to join in this refusal within a certain time, or to face an all-out armament drive, not merely tolerated, but fostered by American scientists?

Such radical plans have been occasionally suggested by individuals, but never seriously considered by responsible groups. It could not have been otherwise: Scientists are too individualistic for any concerted action of this kind; few of them have the temperament of political fighters.

VIII

What then have we to show for five years of effort, except the relief of having "spoken and saved our souls"—and the doubtful satisfaction of having been right in our gloomy predictions? The intrusion of scientists into public affairs undoubtedly has produced some undesirable results. It has made, in some instances, for more and not less passion and confusion, and has made some rational solutions more and not less difficult. Those who now clamor for the use of atomic weapons in Korea—in the mistaken belief that this weapon can win for its wielder any war, any time; as well as those who are horrified at the very idea of the use of atomic weapons, even on military or industrial objectives, owe their opposing but equally intense convictions, directly or indirectly, to indoctrination by scientists. The popular and congressional backing of the concept that American military planning should be based on atomic weapons, and the vociferous popular support for the President's decision to go "all-out" for the development of the hydrogen bomb—both decisions of doubtful strategic soundness—have been expressions of the same "half-educated" public opinion. The Soviet propaganda for the prohibition of atomic weapons and the branding as war criminals of national leaders first to order the use of the atomic bomb under *any* conditions—even for the smashing of unprovoked aggression—would never have achieved the success it has achieved in many countries of the West, if scientists had not convinced so many people that atomic weapons are in a different class from all the other implements of war. Because of their suitability for the mass murder of civilian populations; and because their possession permits an aggressor to achieve his aims by a sudden, all-destructive attack on the cities and industrial plants of a prospective victim, atomic weapons do, in fact, confront the world with a new problem of political morality; but the decisive point is not whether the bombs are used or not, but under what conditions and in what way they are used. The moral issue is that of mass extermination of civilian populations; the atomic bomb merely makes this abominable method of achieving victory in war easier to apply than was the case before, with only high explosive or fire bombs (or, for that matter, gas chambers, and slave labor camps) available for that purpose. The emphasis scientists have put on the destructive potentialities of atomic weapons has permitted communist propaganda to shift the moral indignation of thousands of well-meaning people from aggressive war, and the mass extermination of civilian populations as such, to the one weapon whose threat now restrains the Soviet Union.

IX

While trying to frighten men into rationality, scientists have frightened many into abject fear or blind hatred. This was inevitable. The question is whether, in the final reckoning, the despair and confusion which scientists have helped to create, will prove to be more significant than the understanding of the impact of modern science and technology (and of atomic energy, in particular) on the world political situation that we have been able to impart to those—in America and elsewhere—who are able to face the facts, and to act rationally to meet the challenge. These are the men on whom free society must depend to organize its defenses without sacrificing its basic principles of individual freedom and responsibility; to match the relentless drive of totalitarianism by an all-out defense mobilization of the industrial and military potential of the free world.

In the long run, if the mobilization of the free world succeeds without a war being unleashed to prevent this success, it will be the men who have grasped the fundamental change brought to the world by the discovery of atomic energy, on whom mankind's hope for ultimate salvation of our civilization will rest. These men will have to find a way to organize peace on a permanent, stable basis, to keep the competition between national, political, and economic interests, and the clash of conflicting ideologies within limits set by a world law; and to provide the framework for the rational utilization of world resources for the benefit of all mankind, so as to assuage the social and national unrest that breeds in hunger and poverty.

Whatever little scientists have done in the last five years to help form the minds of such future leaders, and to influence the feelings and ideas of the thousands who will have to support these leaders if their efforts are to succeed through a democratic process, is the justification of our efforts. This is also the only reason why we do not think we should cease these efforts now, when we have so manifestly failed in our first purpose—to stop the trend toward war by bringing West and East together in an organization dedicated to the prevention of an atomic arms race and the development of atomic energy for the benefit of all mankind.

X

While the present emergency continues—and it may continue for many years—scientists—and others who think in terms of rational reorganization of the world—will have to be patient and humble. For the time being they will have to be content with contributing to the solution of day-to-day problems. In every choice American policies will have to make—be it the best way of mobilizing the scientific manpower for the defense effort, or the least painful compromise between freedom and secrecy in research, or between security and the rights of the individual; be it the evaluation of the various suggested foreign policies, such as building up European armed forces, or retiring behind the two oceans to build up Amer-

(*Continued on page 12*)

THE SCIENTIST IN PUBLIC AFFAIRS

We present here a group of articles dealing with the participation of scientists in public life. The first in the series is by an eminent nuclear physicist (wartime director of Los Alamos Laboratory, now director of the Institute for Advanced Study at Princeton) who has played a leading part in the efforts to achieve the international control of atomic energy. Later in this issue we publish reports from several organizations of scientists whose objectives lie in the realm of public rather than professional affairs.

ENCOURAGEMENT OF SCIENCE

J. ROBERT OPPENHEIMER

WE ARE here tonight to honor you and to celebrate the high promise of your future as scientists. We are happy to be with you. We think of that future with respect and curiosity. We think of the discoveries which you will make. We think of the questions to which we today have no answer, and to which you will come to know an answer. Even more, we think of the answers that we have today, and of the new questions that you will put to those answers. We think of how altered and how deepened our knowledge of the world will be before you are through with it. My first wish to you is that you may make and that you may share in the making of great and beautiful discoveries which enrich our knowledge of the world of nature and of man. I have a second wish for you; but that must come at the end of my talk.

I do not propose to talk to you of such topics of the day as the hydrogen bomb and the statutory provisions of the National Science Foundation. If these matters are not in a very different state when you shall have come to assume the full responsibilities of citizenship, you will have reason to reproach your elders for your inheritance.

Science has profoundly altered the conditions of man's life. During the last centuries, the discoveries in science, and their applications to practice, have changed the material conditions of life. They have changed as well many matters of the spirit. They have changed the form in which practical problems of right and wrong come before us; they have changed the focus of moral issues, both for the individual and for governments. They have given us new methods for defining the meaning of problems that face us, and for judging whether or not our solutions are just.

THE MATERIAL BENEFITS OF SCIENCE

The most manifest of the changes are the material ones. Yet even here it takes a certain perspective to see their true extent. Advances in the study of man and other living forms have extended our lifespan by decades. Discoveries in physical science have immeasurably lightened our toil, and enriched our lives. They have given leisure to an ever widening group of men. They have made a reasonable education not a special privilege, but a common right. They have made the world, in its physical dimensions, a small place, and established the means by which people in remote parts of the earth can communicate with each other, can get to know each other, and can learn to work together. They have put at the disposal of everyone the resources of physical power, of ease, and of knowledge that were in the past reserved for the few.

Not all of the changes in material well-being that science offers are realities. Yet the very fact that they are possibilities has changed the nature of the responsibility which we bear, both as individuals and as a community of men and women banded together in government. In the Greek cities, political democracy, and civilization itself, appeared possible only on the basis of a slave economy. Technology, born of science, has altered that; it has enabled mankind, as it has forced mankind, to deal with the issues of slavery as a moral issue. Poverty has always been an ugly thing, and in its extremes a desperate one. Today, it is an evil, in the sense that it lies within human hands and human hearts to abate it. Science can provide us, for the first time in history, with the means of abating hunger for everyone on earth.

THE IMPACT OF SCIENCE ON WAR

Perhaps nowhere has the impact of science more clearly altered the specific terms of a great political issue than in the effects of scientific development on warfare. This is a can of worms with which I have myself unhappily been engaged for some years. It would not be honest to say—though it would not be foolish to hope—that the very terror of modern weapons would in itself put an end to war; it would even be foolish to say that because of this terror the abolition of war and the maintenance of peace have become the one absolute, final objective of all political decisions. There are other things in man's life: his freedom, his decency, and his sense of right and wrong, that cannot so lightly be subjected to a single end. But what we need to remember is that war today has become, and is increasingly becoming, something very different from what it was a century ago or a millennium ago. We need to recognize the new situation as new; we need to come to it with something of the same spirit as the scientist's, when he has conducted

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Address delivered at the Awards Banquet of the Science Talent Institute in Washington, D.C., March 6, 1950.

an experiment and finds that the results are totally other than those that he had anticipated.

Four months before Hiroshima, in the last days of his life, President Roosevelt's thoughts turned to these questions. In the last words that he wrote, in words he did not live to speak, the President looked to the future, to the atomic age. He looked to the past, to the days of the founding of the Republic. He wrote:

"Thomas Jefferson, himself a distinguished scientist, once spoke of the 'brotherly spirit of science, which unites into one family all its votaries of whatever grade, and however widely dispersed throughout the different quarters of the globe.'

"Today science has brought all the different quarters of the globe so close together that it is impossible to isolate them one from another.

"Today we are faced with the preeminent fact that, if civilization is to survive, we must cultivate the science of human relationships—the ability of all peoples, of all kinds, to live together and work together, in the same world, at peace."

THE RELEVANCE OF SCIENCE TO POLITICS

Science has greatly extended the range of questions in which man has a choice; it has extended man's freedom to make significant decisions. Is there anything in the methods of science itself, or in the spirit of science, which can help in the making of these decisions? To what extent is there a play on the word *science* which can mislead us and take us up false roads when we speak of this science of human relationships? Is there anything we can learn from the relevance of science to politics?

If we are to answer these questions, and answer them honestly, we must recognize important and basic differences between problems of science and problems of action, as they arise in personal or in political life. If we fail to recognize these differences, we shall be seeking magic solutions and not real ones. We shall delude ourselves into laying aside responsibility, which it is an essential part of man's life to bear.

In most scientific study, questions of good and evil, or right and wrong, play at most a minor and secondary part. For practical decisions of policy, they are basic. Without them political action would be meaningless. Practical decisions and, above all, political decisions can never quite be freed from the conflicting claims of special interest. These, too, are part of the meaning of a decision and of a course of action, and they must be an essential part of the force of its implementation.

Political decisions are unique acts. In politics there is little that can correspond to the scientist's repetition of an experiment. An experiment that fails in its purpose may be as good as or better than one that succeeds, because it may well be more instructive. A political decision cannot be taken twice. All the factors that are relevant to it will conjoin only once. The analogies of history can provide a guide, but only a very partial one.

These are formidable differences between the problems of science and those of practice. They show that the method of science cannot be directly adapted to the solution of problems in politics and in man's spiritual life. Yet there is relevance of a more subtle, but by no means trivial kind.

JEFFERSON'S VIEWS ON THE ADVANCEMENT OF SCIENCE

In trying more fully to explore this relevance, I should like to start with a text. This text is a letter[1] written by Thomas Jefferson to a young man who had enquired of him as to the usefulness of his studies of science. It was written in the middle of the year 1799, the year in which Napoleon abolished the Directory and began to assume dictatorial power in France, the year before Thomas Jefferson was elected for the first time as President of the United States. Jefferson and the diverse brave and hopeful men who with him laid the foundations of our own government had learned much from the peoples of other nations. Many of their highest political ideals and their most powerful political instruments were built on the experience, the insight and wisdom of European scientists and philosophers. Even today we need to remember that this was so, and that there may be much that we can learn from others, and that we should be glad to learn, as in turn by example we should be glad to teach.

Jefferson's letter starts with a survey of the subjects in science which he believes young Munford ought to pursue. I will quote one characteristic passage which may strike a familiar and homely note for you:

"The science of calculation also is indispensable as far as the extraction of the square and cube roots; Algebra as far as the quadratic equation and the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence."

But that is not really the part of Jefferson's letter which I commend to you. Here it is:

"I am among those who think well of the human character generally. I consider man as formed for society, and endowed by nature with those dispositions which fit him for society. I believe also, with Condorcet, as mentioned in your letter, that his mind is perfectible to a degree of which we cannot as yet form any conception. It is impossible for a man who takes a survey of what is already known, not to see what an immensity in every branch of science yet remains to be discovered, and that too of articles to which our faculties seem adequate."

And later, in the same letter, still more explicitly:

"... and it is still more certain that in the other branches of science, great fields are yet to be explored to which our faculties are equal, and that to an extent of which we cannot fix the limits. I join you therefore in branding as cowardly the idea that the human mind is incapable of further advances. This is precisely the doctrine which the present despots of the earth are inculcating, and their friends here re-echoing; and applying especially to religion and politics; 'that it is not probable that any thing better will be discovered than what was known to our fathers.' We are to look backwards then and not forwards for the improvement of science, and to find it amidst feudal barbarisms and the fires of Spital-fields. But thank heaven the American mind is already too much opened, to listen to these impostures; and while the art of printing is left to us, science can

[1] I am indebted to Dr. Julian Boyd, of Princeton University, for the copy of this hitherto unpublished letter.

never be retrograde; what is once acquired of real knowledge can never be lost. To preserve the freedom of the human mind then and freedom of the press, every spirit should be ready to devote itself to martyrdom; for as long as we may think as we will, and speak as we think, the condition of man will proceed in improvement. The generation which is going off the stage has deserved well of mankind for the struggles it has made, and for having arrested that course of despotism which had overwhelmed the world for thousands and thousands of years. If there seems to be danger that the ground they have gained will be lost again, that danger comes from the generation your cotemporary. But that the enthusiasm which characterizes youth should lift its parracide hands against freedom and science would be such a monstrous phaenomenon as I cannot place among possible things in this age and this country."

To me there are two striking impressions which this letter of Jefferson's makes, even beyond its eloquence and its beauty. The first is that the letter is suffused with the idea of progress, that ideal that owes so much to the development of science and that in turn has provided the great enriching human faith in which scientific discovery and invention has flourished. Jefferson is confident that an increased understanding of the world will lead to progress; he is convinced that the barbarisms of the past cannot stand up against enquiry and understanding and enlightenment; he is confident in man and sure that as men know more they will act more wisely and live better. In our contemporary expressions of hope that catastrophe could be averted and civilization yet be saved, that confidence has lost much of its robustness.

The second point is that for Jefferson there is something in the ways of science that is relevant to political life. Even in religion and politics, he holds that it is probable that things better will be discovered than what was known to our fathers. This conviction that new knowledge is possible, and that not all the answers are known, is of course the stuff of the day-to-day life of the scientist. Science itself does progress; new knowledge is possible; and new knowledge, because it does not destroy or ignore the old, can only increase our understanding. The very idea of the development of science is an example of progress, and of progress which in no true sense can ever be reversed. But this is only part of the story. It is true, as Jefferson knew, that, in the large, science has flourished in conditions of human freedom, and that its growth is parallel to the growth of democratic institutions. Today, looking back on more than a century and a half of further history, we can be even more sure of this. We have seen not only the inspiriting example of science and democracy flourishing together, but the tragic examples of their foundering together. We express the hope that of this tragedy we shall soon have seen the end.

THE SPIRIT OF SCIENCE

What are these lessons that the spirit of science teaches us for our practical affairs? Basic to them all is that there may be no barriers to freedom of enquiry. Basic to them all is the ideal of open-mindedness with regard to new knowledge, new experience, and new truth. Science is not based on authority. It owes its acceptance and its universality to an appeal to intelligible, communicable evidence that any interested man can evaluate.

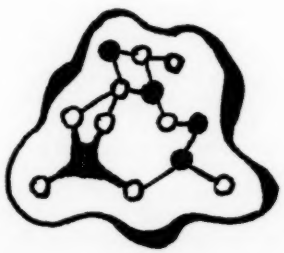
There is no place for dogma in science. The scientist is free to ask any question, to doubt any assertion, to seek for any evidence, to correct any error. Where science has been used in the past to erect a new dogmatism, that dogmatism has found itself incompatible with the progress of science; and in the end, the dogma has yielded, or science and freedom have perished together.

Our own political life is predicated on openness. We do not believe any group of men adequate enough or wise enough to operate without scrutiny or without criticism. We know that the only way to avoid error is to detect it, that the only way to detect it is to be free to enquire. We know that the wages of secrecy are corruption. We know that in secrecy error, undetected, will flourish and subvert.

Let me be clear. Science is not skepticism. It is not the practice of science to look for things to doubt. It was not by a deliberate attempt of skepticism that physicists were led to doubt the absolute nature of simultaneity, or to recognize that the ideas of strict causality embodied in classical physics could not be applied in the domain of atomic phenomena. There is probably no group of men who take more for granted in their daily work than the scientists. Common sense, and all that flows from it, is their principal basis for what they do in the laboratory and for what they make of it on paper. But for scientists it is not only honorable to doubt, it is mandatory to do that when there appears to be evidence in support of the doubt. In place of authority in science, we have and we need to have only the consensus of informed opinion, only the guide of example. No scientist needs to order his colleagues to use a new technique of experiment or to enter a new field of discovery. If he has done this, it will be an invitation to his fellows to follow.

These then are some of the attitudes of mind, these are some of the disciplines of spirit, that grow naturally in the scientist's world. They have grown there in part as a result of a humane and liberal tradition in political life, and in part as a cause of that. The open mind, the reliance on example and persuasion, rather than on authority—these are the heritage of the centuries in which science has altered the face of the earth. Science can help in diverse ways in preserving and extending this heritage. Its very universality speaks across frontiers to make truth manifest in lands otherwise darkened; its material applications create the preconditions—in leisure, in education, in means of communication—for the converse of men with each other. Science provides the material and the intellectual basis for a world in which example and understanding can help all men to improve their lot and fulfill their hopes. Today we need to remember that our country, founded on these practices, and grown strong by their exercise, owes its strength to them. In this time of crisis, we need to cherish that strength.

And this brings me to my second wish for you. I wish you not only the joy of great discovery; I wish for you a world of confidence in man and man's humanity, a world of confidence in reason, so that as you work you may be inspired by the hope that what you find will make men freer and better—in which, working as specialists in what may be recondite parts of the intellectual life of the time, you are nevertheless contributing in a direct and basic way to the welfare of mankind.



THE CONFLICT OF SCIENCE AND SOCIETY

C. D. DARLINGTON

The obstacles to scientific discovery both from within the ranks of science and from society at large were discussed by a British geneticist in the Conway Memorial Lecture recently given in London. Extracts from the address are presented here. Dr. Darlington is the director of John Innes Horticultural Institution in London and the editor of the journal "Heredity."

THE OBSTACLES TO DISCOVERY

THE discoverer himself is the first person to fear and to doubt his discovery. His misgivings may prevent him publishing the awful fact for fifteen or twenty years, as Newton or Darwin did. Or they may prevent his admitting that it has the revolutionary consequences that are obvious to others, so that he remains, like Priestly, the last supporter of the theory which his discovery has rendered unnecessary. Or, again, it may lead him to publish his observations in the most obscure place, half-fearing that someone may notice them, as Mendel did when he buried his experiments in the proceedings of a provincial natural history society. . . .

A practical example will illustrate the obstacle that mere good training sets up to scientific discovery.[1] On May 8, 1795, the French astronomer Lalande recorded a new star. On May 10 he saw it again, but it had shifted its position. What did he do? He crossed out the first observation and marked the second as unreliable. Later it was found that he had, in fact, seen a new planet, Neptune. Now Lalande was an expert on planets. He knew so well that there was no planet out there that he could not discover it. And it was not in fact discovered until it had been predicted from the movements of other planets fifty years later. Even then, the first prediction by Adams in England was not enough. For Adams was unable to persuade either his respectable professor at Cambridge or the busy and important Astronomer Royal to undertake a wild-goose chase, involving a whole month's work, merely for the sake of verifying the prediction of a doubtless very irritating young man.

The very training which is the social activity necessary for discovery serves to impede it, and it does so in various ways. Curricula and examinations stabilize the truth, and they stabilize it of necessity far below the level of the great discoverer. Newton being ploughed in Euclid, and Keynes failing to satisfy his examiners in economics, are examples of the recurring difficulty of finding examiners who understand the implications, the possibilities of discovery, latent in their own subjects.

The opposite side of the picture is shown by the number of great discoveries that have been made by what we may call interlopers, by men with little or no training in the field they have invaded. It is no accident that bacteria were first seen under the microscope by a draper, that stratigraphy was first understood by a canal engineer, that oxygen was first isolated by a Unitarian minister, that the theory of infection was first established by a chemist, the theory of heredity by a monastic schoolteacher, and the theory of evolution by a man who was unfitted to be a university instructor in either botany or zoology. Here again you will see I am speaking only of the greatest discoveries. The highest academic training provides no obstacle to purely technical applications and developments. . . .

THE DIFFICULTIES IN PUBLICATION

Let us now suppose that the discoverer has overcome his internal difficulties. Let us suppose that he dares to offer it for publication. If his discovery is novel enough, it will often lie outside the scope of special journals, and editors who refuse to publish it will have a plausible excuse for doing so. All the more so if the publication of the new involves the criticism of the old and the bitter controversy that such criticism always entails. The innovator will then be told (as I have been told by the editor of a scientific weekly) that such sentiments as his "befoul the life blood of science," a life blood, we are bound to notice, that is adjusted to the needs of standing still rather than of moving on.

At this point, you might imagine, great societies and academies set up for the advancement of scientific knowledge would step in. They have been founded for the express purpose of overcoming all obstacles to discovery. Surely they will be quick to seize on any opportunity that will bring them honor and profit. The most illustrious academies have, however, protected themselves well against this emergency. Before publishing a paper, they submit it to a referee who is chosen to

[1] W. M. Smart, "John Couch Adams and the Discovery of Neptune," *Nature* (London, 1946), CLVIII, 648–52.

We wish to thank Dr. Darlington and the South Place Ethical Society, London, for permission to reprint these sections from the Conway lecture.

be the most eminent authority (apart from the author) in the field in question. This is the man whose reputation will suffer most from a revolutionary discovery. Is it surprising, therefore, that, while the most trite and trivial communications meet with no objection, the referee's opinion of the most important discoveries is nearly always adverse, if not fatal? Waterston and Joule actually had their papers rejected by referees of the Royal Society, and Fourier, by the French Academy. What comment the French Aeademy would have passed on the *Origin of Species* it is unnecessary to ask, for in 1864 its Perpetual Secretary, Fourier's and research in botany and zoology had scriptive report which might epitomize for all time the opinion held of each discoverer by the established generation of his predecessors: it was "empty, pretentious, puerile, superannuated."[2]

RESISTANCE FROM THE "VESTED INTERESTS" OF SCIENCE

When finally a discovery has been published, contradiction and contempt are, of course, the first and second lines of defense against an author who is so inconsiderate as to insist on its importance. Silence and concealment, however, provide further protection. When the Master of Trinity College hid the *Origin of Species* from his pupils, he was merely doing what always has been done, and always will be done, by those who are appointed to protect society against the incursions of science. When, on the other hand, an author is, as I pointed out, too timid to press his claims, he may be disregarded without any trouble. It does not matter then whether the paper is buried in an obscure journal like Mendel's or has appeared in a most prominent position like Avogadro's law[3] of the molecular density of gases, or Lancaster's aerodynamics.[4] Oblivion sheds her poppy carelessly alike over all until a more restless generation has taken possession.

The principle that is now, I hope, emerging is the very general one that any social organ, whether an individual or an institution, which is effective in improving knowledge or in changing society acquires thereby an authority which it uses to stop the very process of change that it has started. Just as Aristotle or Newton, Linnaeus or even Darwin, who had all been forces for discovery during their lifetimes, thereafter became the greatest obstacles to the advance of science, so academies, universities, and societies founded to promote discovery become a means of suppressing it. They begin as the instruments of science. They become the instruments of society. . . .

By the middle of the nineteenth century, therefore, a system of teaching and research in botany and zoology had been stabilized in this country with a well-defined simple program and divided into departments with regular endowments. Vested interests had been created. Civil Service classifications had been laid down.[5] The directions of development had been determined. This academic organism, scarcely weaned, had to meet two rude shocks. Let us see how it withstood them.

The first shock came when, with the publication of the *Origin of Species*, the hurricane of Darwinism swept across the world of science. The whole work of research into living things suddenly gained a new dimension from Darwin's theory of evolution. An immense field of experimental research was opened up by the new understanding of the relations of heredity, variation, and reproduction. The disconnected studies of plants and animals, of microbes and men, became one science, and the word "biology" began to be used with profound implications for human life and thought.

Did this revolution affect the teaching of the universities? Did the departments of botany and zoology, of medicine and agriculture, put their heads together to see how they could exploit their new opportunities? Did Darwinian studies begin to appear in their curricula? Were new departments of biology established in new universities? No, nothing of the kind. Everything went on, so far as possible, just as before. The departments remained sovereign and undisturbed, as they remain to this day. But surely, you will say, a Darwinian Institute, or a Chair of Evolution, was set up somewhere? Abroad, yes; but in England, no; nothing of the kind. Not even a question in a university examination and not even a statue in a quiet London square. Darwin was buried in Westminster Abbey, and Darwinism was buried in our universities. It was not a pure science.

The second shock came from a purely technical development. In 1886 a new optical discovery, the apochromatic objective lens, was introduced by Messrs Zeiss, of Jena. Microscopes were made whose effective magnification was raised from the hundreds to the thousands. In the study of life a whole new world was brought into view.

The development of the apochromatic lens was rather more important for the study of life than was the discovery of America for the study of the earth. Both rounded off a picture which was previously incomplete. But the new lens did even more. It opened the way not only for new facts but for new ideas, indeed for the greatest of all syntheses, the union of the physical and the biological sciences. The connection between the chemical world of molecules and the living world of cells suddenly became visible. The foundations of the three basic properties of life—heredity, development, and infection—were laid bare by the new microscopes.

But, alas! to enter into this new world demanded not only new microscopes and new dyes; it demanded new ways of handling plants and animals, new experimental operations and mathematical treatments. It demanded, in addition to all these, a new way of thinking about life and living organisms.

These were steps that British botanists and zoologists, safely ensconced in their new museums, herbaria, laboratories, and departments, were not prepared to take. Dissection, classification, enumeration, repetition flourished like the green bay tree. Innovation, analysis, and experiment, in one place after another, withered and died. These things are not pure science. . . .

Thus today, over seventy years later, we find that the same work continues at the Royal Botanic Gardens at Kew: it continues without the assistance of the new methods that could give new life to its almost dead inquiries. Indeed it is not enough that this unimproving task should proceed at Kew alone. Five miles away another collection is maintained by its own staff at the British Museum of Natural History, likewise divorced from the new techniques of experiment and microscopy. Each

[2] It is worth noting that the National Academy of Sciences in Washington is still immature in this respect. It has not yet effectively armed itself against discovery and continues to this day to take the awful risk of publishing, without censorship and without delay, the papers submitted by its members.

[3] Always known as a hypothesis because of its author's unassertive modesty.

[4] "The Progress of Science," *Discovery* (London, 1946), VII, 129–35, 160.

[5] Thus the Loveday Report offered National Agricultural Advisory Service Officers fifty pounds per annum extra for having suffered under the discipline of pure science, i.e., Geology without Soil, Biology without Heredity, and Mathematics without Statistics.

struggles to see who shall first have reached a collection of five million specimens.[6]

The "guardians and promoters of botanical science" (as Darwin called them) have thus *guarded* it as it was. They have not gone so far as to *promote* it. What was then a roughly ploughed field has now, after a hundred years, been reduced to a very fine tilth. Again and again it has been ploughed and dunged and rolled and harrowed. And the whisper goes round that one day, if the weather keeps fine, the farmer may sow his seed. But we may wonder whether seed that has been kept so long will still preserve the vital spark. . . .

OPPOSITION FROM THE OUTSIDE WORLD

Let us now turn to the opposition to discovery as it arises from outside science. Scientists and their discoveries are always publicly applauded by the world outside—however disagreeable both may privately be—and the applause reaches a climax in moments of national peril. In happier times, however, a normal attitude to the disturbing effects of discovery is restored. Scientists and their works become the objects of suspicion. This suspicion, when it is openly expressed, does no harm. It is the attempt to disguise it, required by convention, that has such an unfortunate effect both on science and on society. . . .

To arrest the decline of British stockbreeding and to put it once more on a sound foundation, the publication of scientifically compiled records of performance was the first essential. This the Board of Agriculture in a moment of inspiration accordingly undertook to do. It was in 1910 that it published in five languages the first edition of its handbook on *British Breeds of Livestock*.

When this daring work appeared, full of scientifically compiled information, British stockbreeders received a cruel shock. The facts which were stated as achievements, proved in foreign eyes to be the evidence of decline. They were facts which need not have existed if British stockbreeders had not been for so long, and like so many other British businessmen, lost in admiration of their own superiority. It now appeared that, if we were leading the world in cattle breeding, we were leading it, like the Duke of Plaza Toro, from behind. Everything must be done to remove the offending facts. Remove them by reforming the rules of the British Breed Societies? Not at all. Remove them merely from the Ministry's handbook.

Anyone who follows the successive editions of this book will see what social forces were released by the imprudent initiative of this government department. Passages which had given offense to particular breed societies and seemed likely to endanger the export trade were eliminated. Facts were cut out. But the Board girded up its still youthful loins and returned to the fray in the second edition with fresh facts, tables of weights, rates of growth, and milk yields. Only after the 1914–18 war was the struggle lost. The Board, now encumbered with ministerial circumspection and borne down by an overwhelming Conservative majority in Parliament, gave up the battle.

The last stage of deterioration had been reached. Among our war profiteers of 1918, pedigree cattle had acquired the same value that cattle in general have among certain East African tribes. It was no longer a question of the material use of the animal or its progeny, but rather of the social prestige attached to its ownership. The steel magnate or soap-packer was just as keen to have his cow's photograph (with the price in guineas) in one Society journal as he was to have his daughter's photograph in another. And a discussion of meat or milk was as inappropriate for the one as for the other.

Today, if anyone cares to examine the Ministry's handbook, no longer in five languages but expurgated in content and enlarged in type (to conceal the abridgement of the truth), he will find it in every way conforming to the requirements of a patent-medicine advertisement. Small wonder that, in the middle of the last war, on August 8, 1940, the Minister, Mr. R. S. Hudson, felt free to say in the House of Commons that scientific advice was not thought necessary in producing a book of this kind. The improvement of British livestock had been killed by the united labors of the Breed Societies and the Ministry of Agriculture—the two agencies that were set up to promote it.

One technical footnote deserves to be added to this story. During the early progressive years of the revolution, nearly thirty years ago, a technique of artificial insemination was invented in Russia which, if applied, was bound to transform the methods and the results of livestock breeding. It became possible to make one bull do the work of a hundred. It also became possible to choose the best bull in the hundred to do this work. Thus at one stroke the feeding of a quarter of a million bulls could be saved in Britain and the quality of our cattle rapidly improved. Faced with the emergency of the war, one might expect that this new system would have been rapidly exploited by an energetic Minister of Agriculture bent on conserving food supplies and increasing milk production. What happened? Artificial insemination was stowed away, and the Minister appealed to the farmers to raise more bulls. As the war years passed by and the food shortage increased, the numbers of British bulls, pedigree and mongrel alike, steadily rose. And the price paid for them rose too. The farmer's pet had become the nation's parasite. Only today, after ten years of obstruction, is artificial insemination being allowed to develop its proper use in our stockbreeding. . . .

Men who are growing anything, anywhere in the world, for their own livelihood will tell you that the one thing you must not skimp is the cost of the stock or seed. If they are working above a backyard scale, they will even try to use special means of raising stock or seed of their own by methods of choosing the best, methods that were well understood by the neolithic farmer. Not so the Forestry Commission. What it wants is *cheap seed* with which to plant the vast acres the nation has given it. And no research on raising the seed.

When I approached an official of the Forestry Commission with the suggestion that fundamental work in what we call genetics—that is, seed selection and plant breeding such as is done in Sweden, Denmark, or the United States—would greatly improve our forests, that one thousand pounds spent in this di-

[6] "The obstacle which prevents the union of these rival institutes seems to be less serious than that which prevents the introduction of new scientific methods into either of them. It consists merely in an ingenious difference in the size of the paper which is used for mounting the dried plants." (*Science in War*, Penguin Special, 1940.)

rection might save a million in others, he replied that we could let foreigners undertake such research and then, in due course, make use of their results as we wanted, without any trouble. I could not perhaps expect a timber scientist to know that that was just what we had done with the chemical and optical industries at the end of the nineteenth century. And that we had spent an empire and a million men in getting them back.

Balked in this way, I then turned to a higher official, with the same suggestion, noting that his successors might regret that no such research had been carried out in his time. He replied (I may as well quote his exact words): *"I shall be dead then, so it won't matter to me."* Any statement so shameless as this might appear to be candid. But even that, I have to doubt. What both of these men really feared was that fundamental research would be so dangerously successful as only too quickly to expose them to new problems, concerning their whole system of management, or, as I would say, mismanagement of our nation's forests. . . .

In 1934 our British historian introduces his study of history, with which he would, it seems, lead us toward Rome, with an account of equalitarian genetics woven out of his own imagination. And in 1947 we find the *Literaturnaya Gazeta* in Moscow winding up a series of articles on equalitarian genetics, woven out of a Marxist imagination, with a summary by a Russian historian whose knowledge of the subject nicely balances Professor Toynbee's. Society, both in Russia and in the West, finds it comfortable to subordinate the foundations of science to the opinions of historians whose conclusions are known beforehand to satisfy its established illusions, illusions which are not very different under the authority of Rome or of Moscow. In this way the conflict of science and society is resolved. At the same time, the historian is happy to play about with the exact ideas of science, knowing as little of their explosive potentialities as does the little boy playing with the mine on the seashore. Neither he nor his nursemaid knows how the thing is put together, and the first thing we hear is that it goes off pop. . . .

THE NECESSARY BREAK WITH TRADITIONAL ORGANIZATION

No adjustment is possible unless we break the hitherto unbreakable autonomous continuity of many of our social organs. In the first rank stand our universities. The sovereign department which reduces knowledge to administrative fragments must be induced to cooperate. By this means, the cooperation of science and the humanities must be promoted. The breakdown can be achieved partly by guidance from above and partly by giving a new and wider choice of subjects to the student himself. Especially in planning new universities let us avoid the example of the old. Let us occasionally look at what has been done in those other countries which have (if we dare admit it) left us behind.

Let me give one practical example. No university should any longer give a degree to mark the completion of a training which wholly excludes either science or the humanities. Such a principle, if allowing choice to the student in his secondary study, would favor those aspects of the humanities which attracted men of science and those aspects of the sciences which attracted students of the humanities. It would entail the shedding of much that is useless, by which I mean dead, in both. The greatest benefit would come, on the side of the humanities, to the study, not of English literature, but of how to write English (and how not to write it), and, on the side of the sciences, to the study of the history and method of discovery.

There is a second development which would be favored, and that is of the social sciences on which we ultimately depend to complete the union I envisage. Hitherto our social sciences, with their precious cargoes, have sailed by dead reckoning on seas of undefined assumptions. Those assumptions can now be defined in rigorous genetic terms: bearings can be taken and a course mapped through the rocky shoals of superstition. Hitherto the social sciences have been despised and cast adrift just as science as a whole has been despised and cast adrift by the humanities. They have even, if we recall Wells and Keynes, been excluded from the Royal Society. If they will seize their opportunity, they can now be given their proper value. . . .

From a system of education regenerated in this way secondary improvements would arise. We urgently need some method of intelligently organizing scientific discovery and its communication. It is no longer sufficient to have our systems of research controlled by authorities, some of which are indifferent to the result and some anxious to avoid any result at all. There are some who suppose that by combining the bodies governing research into one Ministry of Science we should secure greater coherence and vitality in the administration of research. But from what I have said it will be clear that incoherence, although serious, is not the fundamental fault. That fault is constitutional opposition to research, and the consequences of research, in all the great organs of authority. They are all stuck in the mud, and no one notices it. How are we to get anyone to notice it? We need a Ministry of Disturbance, a regulated source of annoyance; a destroyer of routine, an underminer of complacency, an *enfant terrible:* or will nothing short of another war serve us?

Five Years After

(*Continued from page 5*)

ican defense; of offering Federal Union to the democracies of Western Europe, or of encouraging the formation of a Western European federation without the United States; be it the evolving of an effective program of civil defense and protection, or the scattering of potential atomic bomb targets over the countryside; in all these and many other decisions, scientists should be able to contribute important arguments that may escape those not fully and continuously aware of the implication of scientific progress for the problems at hand.

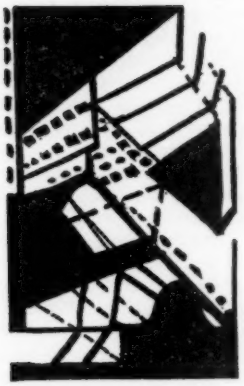
Because of this possible contribution to the formation of national and local policies, the continued political activities of scientists will remain worth while even in the dark years ahead, when the dominant question will be, how to avoid defeat in the already raging power contest, and, if and when this problem is successfully solved, how to terminate this power contest without resort to the ultimate irrationality of war.

In the background of their minds, giving direction to their thinking on all the practical decisions at hand, scientists, more than anybody else, should and, we believe, will preserve the fundamental conviction, born of close acquaintance with the powers liberated by modern science for the destruction of mankind or for its progress toward greater security and freedom: the conviction that mankind is ready and must be willing to terminate the endless sequence of wars, and to create new forms of social organization under which the limitless human capacities for effort and sacrifice will be directed in a rational way toward constructive ends.

—E. R.

THE POLITICAL PHILOSOPHY OF SCIENTISTS

WAYNE A. R. LEYS



The strengths and weaknesses of the Scientist as Politician are examined in the following article. Dr. Leys is vice-president and professor of philosophy at Roosevelt College in Chicago.

ONLY a few years ago we thought that the physical scientists were secure in their freedom to seek the truth and to publish their findings. At that time we were worried about the freedom of the social scientists and, in some areas, about the biologists. Now it is the physicist and the chemist whose work is subject to political interference, because their knowledge threatens industries and national armaments not only with destruction but also with ruinous obsolescence. The physical scientists are experiencing many pressures in the shape of financial control because the annual cost of their research programs exceeds half a billion dollars in this country alone. Science is an enterprise "affected with a public interest."

Some of the men of science are not willing to fall back into that ancient political philosophy which decrees that some classes shall be custodians of the ends of society and others shall merely supply the means. At one time priests, soldiers, and politicians may have declared and interpreted the purposes of the community, while artisans and technicians took orders. Today such a system looks like slavery for the scientists and, quite possibly, it might mean a strangling death for science itself. Furthermore, the reputation of ruling classes for wisdom is seriously doubted, and scientists question whether our leaders in government and business can manipulate the new instruments of explosive power without blundering into catastrophe.

Such is the setting for the present inquiry into the political duties of scientists. The immediate question is: How should physicists and engineers influence the application of their own knowledge?

One conceivable solution of the problem is to make the scientist a king. Foreshadowed in Plato's *Republic*, the ideal of combining knowledge and power is a perennial which continues to attract admirers;[1] but in recent years this method of emancipating the men of knowledge has been viewed with alarm by those who believe that scientist-rulers would reduce the rest of the population to slavery or the guinea-pig life described in Aldous Huxley's *Brave New World*.

Assuming that enslavement *by* scientists is as undesirable as the enslavement *of* scientists, let us examine some of the objections to a government of and by the learned. Perhaps we may discover clues to a system of social control that will not enslave anyone.

THE SCIENTIST AS POLITICIAN

Typical of the scientists' proposals that create distrust is the recent suggestion that the population of our great industrial cities be quickly dispersed. No doubt, this measure would be an effective way to prevent the mass destruction of several million people by one bomb. But the atomic scientist, with his eye on one result, forgets the agonies and cruelties of moving large populations, as witness what has happened in central Europe, in Russia, and in India in recent years. He forgets that human beings generally are not interested in survival at *any* price. Robert Louis Stevenson was correct when he compared humanity to the people who live on the side of a volcano, occasionaly decimated by an eruption, but returning to their former abodes to carry on the activities that are dearer to them than life itself.

The population dispersion proposal shows why "experts" are feared in government. Habituated to a life of problem-solving, the expert accumulates and organizes his data with a view to achieving a definite result. He excludes all sorts of facts as irrelevant and arrives at a conclusion which he believes to be true, "other things being equal." In many respects this is the opposite of the politician's procedure. The politician is dealing with human desires, with the ends of life; he is always asking: "What other things are not equal?" Whenever a proposal is made, he asks what other considerations cannot be ignored. Whereas the politician may be so considerate of the plurality of human interests that he will sacrifice a great future good to avoid a small immediate unpleasantness, the scientist tends to go to the opposite extreme. The scientist will persevere in the pursuit of a major objective even though in so doing he steps on all the toes of all the people. As Donald Stone has said, "The tendency of the specialist to apply the criteria of his specialty often produces dogmatism, prejudice, and narrow-mindedness, particularly toward other large fields. He tends to oversimplify the problem of government."[2]

Although the atomic scientists bring to the political forum insights into a problem that the average non-scientist scarcely senses, it would seem that the atomic scientists must enter their claims and defend them without presump-

Adapted from an address delivered at Roosevelt College, Chicago, on April 26, 1950.

[1] See H. G. Wells, *The Open Conspiracy* (1928); Stuart Chase, *A New Deal*, (1932), pp. 177–78; Alexis Carrel, *Man the Unknown* (1935); C. S. Bluemel, *War, Politics, and Insanity* (1948).

[2] Donald C. Stone, "The Top Manager" in Joseph E. McLean (ed.), *The Public Service and University Education* (Princeton, N.J.: Princeton University Press, 1949), p. 65.

tion of all-inclusive wisdom. When the smoke of political battle has cleared, it will probably be discovered that some of the strongest opposition to the proposals of atomic scientists has come from other scientific specialists. Numerous cases can be cited where political conflicts occurred because different kinds of experts could not understand one another. This has been true in the controversy over health insurance. That absurd spectacle has dragged on through several decades because medical men and experts on finance failed to influence one another. Instalment buying was invented in the nineteenth century, and insurance was invented in the seventeenth century. If we were financing other products the way we have been financing medical services, we would still be a poverty-stricken nation. In the absence of intelligent give-and-take, the official thinkers of the medical profession ran the risk of real enslavement to non-medical politicians who represent the dissatisfied patients.

When Congress created the Tennessee Valley Authority, a number of conflicts were referred to an administrative agency for resolution. We possess an excellent record of the opposition of experts in the planning of that great project. In trying to decide where dams should be located, the engineers would come up with a map "showing just where the water would extend and what land must be purchased." The agricultural experts argued against taking any land for public use that could be used as farm land. Recreation experts urged the purchase of wide "protective strips." The malaria expert wanted to avoid impounding water in flat shallow areas. Any one of these experts would have created a system of waterways in the Tennessee Valley that would have been highly unsatisfactory from a number of standpoints.[3] In this instance, long and sometimes heated negotiation under rather favorable conditions produced results that were imperfect but far better than the results desired by any one group of experts.

What about the well-known distaste for politics, which is professed by many scientists? In the mid-twentieth century the only escape from politics is probably to be found in slavery. Those who do not want to be enslaved may be able to choose whether their political activity will resemble that of certain medical spokesmen or that of the experts in the TVA. Political skill is not necessarily epitomized in the "typical" politician's leather lungs, nerves of steel, iron stomach, sensitive ear, and flair for showmanship. Our business executives are another kind of politician. Our negotiators are still another kind. The distinguishing characteristic of political man is his capacity for enduring and dealing with human opposition. The fundamental assumption of democratic politics, as opposed to military dictatorship, is that some (not necessarily all) other human beings are worth the trouble required to persuade them to agree with us; and, in order to persuade them on one point, we are willing to be persuaded on some other point.

If scientists are to influence public policy, more of our scientists will have to receive a good political education.[4] By a good political education I do not mean simply book-learning about government. I mean the emotional conditioning to conflict that makes it possible to show as much patience and respect for human opposition as for the resistance of nature.

SUCCESSES AND FAILURES

In their generally commendable effort to be citizens, the atomic scientists have sometimes succeeded and sometimes failed. In urging what developed into the Manhattan Project, they succeeded in reconciling their views with the interests of non-scientists. In the endless negotiations over details they must have reckoned with other points of view, because the President's Scientific Research Board concluded that "support for basic research should be provided by grants rather than by contracts. . . . Details of expenditure of funds should be controlled at the point where research is being carried out, rather than from a central agency."[5]

On the other hand, in their first efforts to arouse the public to the importance of armaments control, the atomic scientists tried to scare the layman. Mankind has never responded constructively to fear and usually has not responded very long. The scientists waved a bomb and were surprised when they were locked up. The appeal to fear gave some of our more unscrupulous politicians a chance at publicity. J. Parnell Thomas seized the opportunity and was fantastically successful in maligning Dr. Edward Condon.[6]

It is necessary to protect scientists and scientific communication from publicity-seekers like Parnell Thomas and Senator Joseph McCarthy. This is a political problem which can be solved only by persuading electorates to vote such men out of office. Instead of relying on appeals to fear or upon authoritative reiterations of the "scientific point of view," scientists will have to win friends outside of their own sacred fraternity. Such friendships can be established by recognizing and cultivating those concerns of the layman which can be reconciled with and, indeed, fostered by the projects that the scientist regards as essential to the public welfare. In these matters, as in the coming debates over the uses of atomic power, the scientist has expert knowledge about both means and ends. But, if science is to play a role in a democracy, the scientist must be prepared to recognize, emotionally and intellectually, that other occupational groups have legitimate interest in ends that do not seem especially important to the scientist.

Slavery is inevitable neither for the learned man nor for anyone else. Yet the price of freedom is not cheap: it is broader sympathies and a greater capacity for negotiation than many of us now possess.

[3] See David Lilienthal, *TVA—Democracy on the March* (New York: Harper, 1944), pp. 67–70.

[4] More of our non-scientists will also have to receive enough education in science so that they have some appreciation of what scientists are trying to do.

[5] John R. Steelman, *Science and Public Policy*. A Report to the President, August 27, 1947, I, 50.

[6] See Louis Welborn, "The Ordeal of Dr. Condon." *Harper's Magazine* (January, 1950), pp. 46–53.

NOTE ON THE COMPLEAT EXPERT

JOHN W. McREYNOLDS

Dr. Ley's sympathetic misgivings about the capacities of the natural scientist in politics find sharper expression in the following remarks by a political scientist and former newspaperman. Mr. McReynolds is associate professor of technical journalism at Kansas State College.

I HAD started to introduce myself as a social scientist who was going to talk about social science, but gave that up as a bad idea when it occurred to me that the readers might think they had got hold of the wrong journal. Next I tried to eliminate the "social," and say that I was a scientist about to talk about science. This lie stuck in my throat. I finally decided to introduce myself as a former newspaperman who was going to talk about language. Since this is at least half true, allow me so to introduce myself.

I am not sure just when the inspiration for this note first began to make itself felt; however, I think it all came to a head the morning of October 16, when the Durham, N.C., *Morning Herald* announced to me that

U.N.C. PROFESSOR CALLS FOR HARMONY WITH RED NATIONS

I wasn't particularly surprised—sociologists are like that, sometimes[1]—and, idly curious, I read the story. I must say that I certainly *was* surprised when it turned out that the caller for harmony was Dr. So-and-so of the Department of Physics.

Now this brings me to the subject of language.

Take, for example, the words *science* and *scientist*. You might add to these two, *objective* (which is a nice word) and *subjective* (which is a very naughty one). Aside from what drivel the dictionaries may have to say about it, one who is a Scientist, who studies a Science, whose method is Scientific and Objective, is one who will arrive at Truth. This definition is one that clearly prevails.

[1] They are also "more or less bald, and exactly thirty-two." See O. Henry, *Sociology in Serge and Straw.*

THE PAT ANSWER

We have lived a century and more in a world which cries out for the right answers. Football predictions, election polls and pollsters, the men who analyze your personality in the evening papers—all of these seek to provide right answers. And, more than this, they have come more and more to seek to provide *pat* answers.

With the drift toward pat-answerism has come the notion that *science* can and will provide the pat answers; and, again with the evil of extremism, this has developed into the notion that any thing that *calls itself* science will provide the right answers. Psychology, which used, in the words of Montesquieu, to "consider mankind," has now become a natural science, with unhappy results for mankind and the white mice. Political philosophy and government are now Political Science, which includes, among its minor branches, something called "theory." There are books, for instance, called *Political Science, The Science of Politics, Elements of Political Science,* and so on; also, *Introduction to Social Science,*[2] which is a lulu.

The reason for the laboratory-sounding titles is that a good many people believe that Science yields Right Answers. The common man (i.e., freshman) is not to be impressed with words like Philosophy and Art: he wants Science, and Science he gets.

[2] Atteberry, Auble, and Hunt (Macmillan, 1941). Very scientific, and full of basic factors, condition tables, and so forth.

This article is reprinted from *The American Scientist,* April 1950, with the kind permission of the editor and Mr. McReynolds.

Now I have long been under the impression that scientists (which is a term I use to include faculties of biology, physics, chemistry, botany, zoology, and, oddly enough, mathematics) are a little resentful and a little amused at this climbing aboard the band wagon.

I have been, and still am, also under the impression that both attitudes are despicable.

Anybody entitled to be called Scientist should spend at least two minutes a day communing with himself in all humility, and consider the fact that because he is so called there are lots and lots of people all over the world who will take his word as gospel.

The Scientist, for good or ill, and whether he wills it or no, has the confidence of the world, and he should live his life accordingly.

THE PHYSICIST ON POLITICS

Let me now return a moment to the newspaper story referred to earlier. It concluded with a quotation from the physicist, as follows: ". . . In natural science we must begin our investigation without preconceived notions and this certainly is equally true in political science."

Bosh. In the first place, I have yet to meet a natural scientist who either (*a*) hasn't got a good many preconceived notions of his own that he isn't aware of, or (*b*) isn't very cautious about talking about preconceived notions, or (*c*) hasn't spent some of his best years trying to find out what his preconceived notions are.

In the second place, I don't like the implied argument. It says, in effect: first, I am a Scientist; second, I have come to the following conclusion about how to solve the world's ills; third, this is therefore the right answer, whether those men who make a profession of this sort of problem think so or not.

One of my favorite pieces of poetry is this: "Bracket," it goes, "*m*, plus *e*-sub-zero over *c*-squared bracket," it continues, "*c*-squared the whole blame thing over the square root of one minus *v*-squared over *c*-squared."

(Well—perhaps it isn't really a favorite, but, like the writings of Eliot, it appeals to me because of its mystery.)

But to get on with this, the man who wrote that immortal line had to spend a good deal of his life arriving at sufficiently well-worked-out notions of what *c*, *v*, *m*, and *e* were before he could establish the relationship,[3] even if the whole thing is pure whimsey.

And how about political science? Or the ideas of the men who study politics and political life?

There are whole books and sections of books dealing with the one term *sovereignty*. This is also true of *state*, *nation*, *democracy*, *government*, and so forth. In short, it requires no small amount of study to be able to kick those notions around.

Suppose I were to tell you that I have a notion about the nature of matter which would make ionization one of the simplest of problems. In fact, I worked it out because I felt that the stuff they tried to teach me was so *un*simple that I was unable to handle it well enough to make "A" on the course. Or, for that matter, "B."[4]

What do you suppose would happen if I were to speak, as a member of some university anthropology department, and tell cheering thousands how better to understand the nature of ionization? Nothing. Absolutely nothing. Because there wouldn't be any cheering thousands. The chemists and physicists would ignore me and go blindly on in the same old bungling way.

But why did they listen to the physicist on political harmony?

Two reasons. First, he is a Scientist, and we have been all through *that*. Also—and this reason is full of all sorts of twists and ramifications and things—he had a right to his opinion about politics; I have no right to mine about ionization.

The physicist, as I have noted elsewhere,[5] can run for office, be elected to office, and hold office on the strength of his curbstone notions about the state, the nation, the people, government, sovereignty, and the like. This is our kind of government—a kind which I believe to be the best.

But the nonphysicist cannot get a job on the strength of his funny ideas about physics. This, too, in some sense, is our kind of government; the plumber must be examined and licensed, as must the doctor, druggist, lawyer, and so forth.

So we see that in addition to the confidence of the world, the Scientist, in our country at any rate, has the freedom to treat this confident world pretty much as he chooses. He even has the freedom to betray this confidence.

THE BETTER PART OF VALOR

But we were talking about language, and I seem to have got off the path.

There are times, I feel, when a man uses his freedom to use language, either spoken or written, when he should instead use his freedom to keep his mouth shut.

For a long time after the war, we had a run of headlines about the Vets. "Vet Slays Six," or "Vet Goes Berserk," and so on. Finally, veterans who did *not* burn down orphanages began to resent it.

Well, it is high time the Scientists started doing a little resenting, because they are getting to be tagged, and it is a shame.

Part of this is because of what was noted earlier about Scientists. Part of it is because there *are* Scientists who like to take an active part in the political life of their communities. Part of it is because of the Bomb.

The Bomb is a Secret.

It does no good to tell the general public that any fool with a Ph.D., two billion dollars, and thirty years' experience can make one. And furthermore, it is a Dread Secret, and it is in the hands of the Scientists. On top of all this, the Bomb is still considered a political secret—whether it is or not.

So now it comes to this: (1) Scientists, because they are so called, have the confidence of the world; (2) they can make Bombs; (3) they can make political speeches; (4) propositions (1) and (2) make the speeches in (3) somewhat more important than they probably really are.

The point of this is to add a fifth proposition: (5) Scientists should attack the problems of society *qua* society with at least as much care and study as they attack the problems of the Bomb *qua* experimental physics.

It has often struck me as being unfortunately funny that a physicist who carries more stuff in his head than the average fifty men, can draw an absolute blank when he examines just one of our contemporary political problems. I refer to the popular fear that Communists will learn physics.

Now, aside from any question of right or wrong, and with no examination of whether Communists should be allowed to teach in state universities, or whether college presidents should be allowed to hire and fire as they see fit, it is a plain, ordinary *fact* that "the man in the street" wants to be sure that the atoms are on his side.

It does no good at all to tell the common man that science is objective; either he won't understand you or, if he does, he won't believe you. I said earlier that it does no good to tell him that the Bomb is not a Secret, even now that the Russians *do* have it.

He doesn't understand atoms and he doesn't understand communism; all he understands is that he wants the atoms to be on his side.

And that, dear hearts and gentle people, is why he gets upset when a Scientist "calls for harmony with *Red* nations." This is, I believe, considerably simpler than the *c*-squared business.

I remember hearing a chemistry professor get off his subject once and give us a long lecture on the evils of war. He was telling us that some brilliant young chemist was killed in the first World War. He made a pretty inspiring speech, and when he got through, one of his students said, "Sir, we are with you a hundred per cent. You have evidently thought about this for some time. What would you have to *do*?"

He looked blank for a minute, then told us to write letters to our congressman, saying that we didn't want any more wars.

Like the Scientist who, in the face of all the intricacies of political theory and political fact, "urges harmony," this professor had a pretty pat answer. However, it could hardly be called brilliant.

But both answers have this one great weight in their favor: they were given by Scientists.

Now the purpose of all this rambling prose has not been to urge that Scientists stay out of the popular lecture halls, lest the Communists take over. I have more faith in the "common man" than that. But it is to say this: if Scientists are not considerably more careful than they seem to have been of late, they will lose the confidence of the common man, the man who wants to be sure that the atom is on his side.

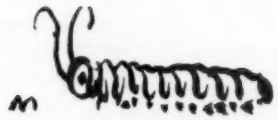
The Scientist needs, therefore, to educate himself in humanity. For if he loses the confidence of the common man, it will be a tragedy no words can describe.

[3] You could also spend a good deal of time trying to figure out how much "one" is.

[4] I will send this to anyone curious enough to enclose one dollar to cover costs and handling. I will not, however, guarantee high marks with it.

[5] See *Scripta Mathematica*, June 1949, pp. 156–58.

WASHINGTON NOTES



ANNE WILSON MARKS
Washington Correspondent for the Bulletin

THE last weeks of 1950 were the worst Washington has seen in many years; and the atom helped to make them so. Against the background of the Korean military crisis, President Truman, in his now-famous press conference on the morning of November 30, failed to note the "handle with care" sign on the atomic bomb, and told reporters that consideration had been given to its use in Korea. A convulsion of international proportions followed.

Washington reaction centered on Capitol Hill, where all shades of opinion were expressed. Chairman McMahon, of the Joint Committee on Atomic Energy, cautiously pointed out that "under the law the decision has to be made by the President . . . very grave and important factors will have to be taken into account . . . military, diplomatic, and psychological. . . ." He declined to discuss the matter further.

Other Congressmen rushed to voice their opinions to reporters—some for, some against atomic bombing. Those who favored its serious consideration did so on the ground that we should employ every weapon in the arsenal to win the fight. The public comment provoked by the President's careless remark indicates that a large body of people, in and out of Congress, still think that now, as in 1945, one or two atomic bombs will turn a military tide. One member of the House of Representatives suggested that we lay down a radioactive barrier along the "entire frontier" of Manchuria. It took General Collins and a flock of news commentators to point out that use of the weapon against the Chinese Communists was not very practical from a military standpoint.

The world-wide excitement stirred up by the incident precipitated the December meetings between President Truman and Prime Minister Attlee. This high-level diplomatic exchange resulted in their public assurance that neither country was in a trigger-happy mood and that each was agreed to close joint consideration of questions involving atomic weapons.

COMMITTEE HEARINGS ON CIVIL DEFENSE

Meanwhile, the Korean crisis had blasted the civilian defense movement out of its doldrums. On November 29, Representative Durham, Vice-Chairman of the Atomic Energy Committee, introduced a civilian defense bill in the House. It was referred to the Armed Services Committee (which appointed a subcommittee made up of members who also serve on the Joint Committee), and hearings got under way at once. In the Senate, Brian McMahon's companion bill was stalled briefly while his committee and the Senate Armed Services Committee skirmished over which should have jurisdiction. Chairman McMahon argued that his atomic energy group had done all the preliminary work, that civilian defense meant defense primarily against atomic weapons, that jurisdiction should go to a committee whose orientation was civilian, rather than military. But, as in the House, the bill in the Senate was referred to the Armed Services Committee, and all the Joint Committee got for its pains was an invitation to come and watch the hearings.

A lady in Georgetown (who probably learned about preparedness from a general named MacArthur, to whom she was once wed) is taking more direct action—by building an atomic bomb shelter in her swank town house. Washington papers report that when the contractor arrived to start digging in the basement, she called all over town trying to get some sound engineering advice on atomic-proofing, but without success. The contractor announced to the press that he knew as much about it as anybody, and went to work.

THE DECLASSIFICATION FRONT

If the Atomic Energy Commission hasn't done anything else in the past year, it has thoroughly covered the above subject. But it has done something else. For one thing, it has finally plugged up the holes on the organization chart. By November of 1950 the AEC was at full strength for the first time in almost a year.

Its new chairman, Gordon Dean, has been in the news often since his appointment to that post. *U.S. News and World Report* stirred up quite a bit of comment recently by asking the Chairman whether he agreed with David Lilienthal "that there have been too many secrets in this program." Mr. Dean observed, somewhat wryly, that this was a pretty "broad question," and then proceeded to some answers. The press interpreted his replies to mean that he not only agreed that there were too many secrets but also that the AEC was thinking about declassifying some of them—such as those relating to the outward physical characteristics of the bomb itself. A second look at Mr. Dean's answers suggests, however, that he was not focusing on the "broad question" of secrecy. He appears, rather, to have been stressing the need for relief from a difficulty which troubled the Commission as long ago as the AEC investigation in the summer of 1949. The Commission was given a rough time of it then when called upon to explain its numerous emergency personnel clearances for the Eniwetok test.

The problem still arises, for example, when the Department of Defense and AEC join forces in a large-scale secret test. Many of the participating military personnel will already have had departmental investigation and clearance for top secret work in their own service. But before the Los Alamos AEC contractor can permit them access to restricted atomic data, another special investigation—this time by the FBI—is required for each individual. Through no fault of the FBI, this makes for many weeks delay in getting urgent projects started.

This requirement of dual clearance has long been a thorn in the military's side. As defense activities are stepped up, and the number of people involved begins to run into many thousands, the military is pressing the Commission to get an amendment to the Act.

But the type of amendment that would cure this problem would not mean less secrets; it would mean only that the same catalogue of secrets could be made to flow more freely between compartments.

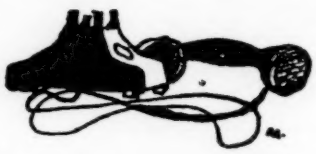
Actually, the only recent activity on the declassification front was the Three-Power announcement of a revised Declassification Guide permitting release of information on low-power reactors. The four-year period of gestation required to bring this little mouse to the light of day is not the most encouraging news on the scientific front.

But the companion piece to this news—AEC approval of the North Carolina research reactor—does represent a modest step forward. The Commission warmly congratulated the Consolidated Universities group "on having the foresight and initiative" to put up its own money and technical talent to make this venture possible. The operation of this reactor under private auspices on a completely nonclassified basis may serve to narrow the gap a little between the purely academic and the more practical involvement of private interests in atomic energy.

Ever since the recommendations of the AEC Industrial Advisory Committee in December of 1948, the question of whether and how private enterprise might be allowed to take part in atomic energy development on some kind of independent basis has been bothering the Commission. For a long time it was able to stave off the ideas advanced in behalf of industry by calling for more specific proposals. This, together with the fact that industry's pressures were rather feeble, spared the Commission from making any serious effort to bring business into the program except as a "hired hand." Now the precedent of the North Carolina reactor has again stimulated efforts by industrial groups to get into atomic energy. Such efforts may eventually result in the "strengthening" of "free competition in private enterprise," as the Atomic Energy Act seemed to expect; unless, of course, the stresses of mobilization may be thought to foreclose even modest private attacks on atomic problems.

SPECULATION ON THE H-BOMB PROGRAM

Among the larger questions posed by the national emergency is the H-bomb. In December the Joint Committee met with the Atomic Energy Commission to hear a progress report on the hydrogen bomb project. The committee received this report in an atmosphere of increasing public skepticism about the feasibility or military value of the superbomb. What the AEC had to say is anybody's guess. But a vague air of pessimism surrounds the project.



This has developed despite strict injunctions to secrecy by the AEC and the President. Public speculation began last winter, almost as soon as the President instructed the Commission to "determine the feasibility of a thermonuclear weapon," and took on real substance with the publication by *Scientific American* and the *Bulletin of the Atomic Scientists* in March, April, and May of the excellent papers by Ridenour, Bethe, and Bacher. Then, in an official press conference in May, AEC Commissioner Sumner Pike stated that the H-bomb's feasibility lay "somewhere between probable and possible." Six months later, in another press conference, Gordon Dean was saying that Pike's estimate still stood, and (in an interview with *U.S. News and World Report*) that we didn't have such a weapon and didn't know "if we will have such a weapon." AEC, he said, was carrying out the President's directive; it was not a simple job; but the Commission was "just as interested . . . in finding out that it won't work as that it will."

Speculation increased with the appearance of the December 19 issue of *Look* magazine. An article signed by Stephen White, a science reporter well known in atomic energy circles, concluded that "on the basis of scattered remarks, meaningful omissions, and statements made by European scientists," it was doubtful that the hydrogen bomb could be made, "or is worth trying."

Some of these conjectures about the status of the program will produce repercussions on Capitol Hill. At least one member of the Joint Committee is on record with deep reservations about the hydrogen project. The ranking Republican Representative on that committee, Sterling Cole, of New York, questioned the value of the H-bomb as a military weapon in a speech on July 17. He expressed "grave doubts as to whether such a bomb would be a very useful addition to our arsenal."

"We must not be misled," said Representative Cole, "into the pitfall of feeling we are secure. . . . We can well reflect on how we got where we are. . . ." Some Congressmen are beginning to reflect.

THE NEW APPROPRIATIONS

For one thing, tremendous sums of money are involved. In addition to the $260,000,000 approved for the AEC in a supplemental appropriation in September of 1950, the President early in December asked Congress for another billion dollars for emergency, over-all expansion of the atomic energy program. These sums together total close to the amount spent on the entire wartime bomb project.

In short, the AEC is doubling its present size. It is an undertaking of staggering proportions. The Du Pont Company, contractor for the Savannah River project (reported to be a tritium-plutonium plant), is already swinging into action on a 250,000-acre tract in South Carolina. Whole towns are being uprooted in that area. On December 15 the Commission announced the selection of a site for another U-235 gaseous diffusion plant at Paducah, Kentucky. Some idea of the size of this one can be gained from the fact that it will consume almost as much electricity as the city of Chicago.

Such an industrial effort, particularly in a nation straining to shift into a wartime economy, multiplies the pressures and problems to which Congressmen are subjected. There is no longer money and resources enough for every worthy project. The legislators will have to choose between competing needs.

Last summer Sterling Cole appeared to be alone in his concern that development in other military fields should not be "side-tracked just for the all-out development of a bigger and noisier weapon such as the superbomb." He is now beginning to get a little company in his worry. For example, the House subcommittee which reviewed the AEC request for a billion-dollar appropriation in December appeared to be somewhat uneasy about the large-scale commitment to the super project when, as the AEC Chairman told them, the Commission itself "did not know today as to the feasibility of the H-bomb program." One member of the committee, Senator-elect Francis Case, asked the Commission what it would do "if the Congress said that no part of the funds should be available for work on the hydrogen bomb

(*Continued on page 22*)

DEMOCRATIC LOCAL GOVERNMENT IN THE AEC COMMUNITIES

LYMAN S. MOORE

The problems of introducing private ownership and self-government in the three communities now managed by the Atomic Energy Commission are here discussed by an expert on city management who has served the Commission as consultant. He informs us that his views are entirely unofficial, and that the military crisis, which has developed since the article was prepared, may well involve the postponement of some of his recommendations. Mr. Moore is city manager of Portland, Maine.

THE 1950 census lists neither Oak Ridge, Tennessee, Richland, Washington, nor Los Alamos, New Mexico, as "urban places of 2,500 or more inhabitants." By 1950 the population of Oak Ridge is estimated at 31,000, Richland at 23,000, and Los Alamos at 10,000. Oak Ridge is probably the fifth largest city in Tennessee; Richland, the seventh largest in Washington; and Los Alamos, the fourth largest in New Mexico.

It is well known by now that each of these communities was created by wartime necessity as an adjunct to research in atomic energy and production of atomic bombs—Oak Ridge and Richland from small crossroads towns, and Los Alamos on a mesa 8,000 feet above sea level. Each was built in urgent haste by the military, and each is now a responsibility of a federal civilian agency, the Atomic Energy Commission.

What does the execution of this responsibility mean—to the scientists and production workers who live in the communities, to the federal taxpayer who pays the difference between costs and revenues, and to the American citizen who has such a tremendous stake in the effective development of atomic energy for wartime and peacetime use?

Soon after the transfer of responsibility from the military to civilians late in 1946, the Atomic Energy Commission recognized that the management of these three communities presented problems of fundamental importance. It was further recognized that members of Congress and citizens generally who would feel humble in probing the mysteries of atomic science would approach the problem of town and housing management with informed confidence, and that, therefore, the AEC's policies in this field would be subject to searching analysis and possibly criticism. It was also realized that standards of municipal service would affect the AEC's capacity to recruit and retain skilled employees, and that the economy in achieving effective operation in the towns would heavily influence Congressional appraisal of all AEC operations.

A broad statement issued by the AEC in the early days of civilian control (December 15, 1947) declared a policy of maximum consultation with the residents in the management of the three communities and expressed the intent that "residents shall enjoy those facilities, services, and activities which are properly a part of American community life."[1]

It was implied, but not expressly stated, that the communities should be converted to normal American communities as quickly as possible, without jeopardizing the major objectives of the atomic energy program.

In 1947 and 1948, the AEC was, of necessity, feeling its way while gaining experience with the management of housing and towns. The Commission could sense, but not solve, the basic problem of how fast a model community must be developed at each of the three locations—whether it was necessary to move faster than normal well-governed communities which also face a huge backlog of deferred improvements which cannot be financed for decades. In these years the Commission also began to be aware of the problems raised by subsidizing standards of service for such activities as recreation, fire protection, police protection, and education, which, in some cases, were two and three times the national average for comparable cities.

[1] "General Manager's Bulletin," Number 63.

POLICY OBJECTIVES SET IN 1948

In 1948 a series of recommendations was made to the Commission on policies governing the management of the communities. These suggested (1) that the accounting system be overhauled to produce uniform fiscal reports for the three towns as to housing, commercial operations, utilities, and government; and (2) that fiscal policies be stated which would require (*a*) commercial properties to produce a maximum return consistent with prevailing prices, (*b*) utilities to cover operating costs and to amortize part of the initial investment at prevailing utility rates, (*c*) local government revenues to cover operating costs if combined with a federal payment in lieu of taxes, and (*d*) housing rentals to pay for all operating costs and to amortize part of the construction costs at prevailing rents. They also suggested (3) that responsibility for local government be separated from responsibility for real estate operations at each of the three locations; (4) that steps be taken to encourage private construction of both houses and commercial properties at Oak Ridge and Richland; and (5) that the AEC create both financial responsibility by the citizens and a local organization that could be converted into a local government. The final recommendation was that "AEC policy should continue to hold democratic, financially responsible local government as its major objective toward which all transitional processes and arrangements should point."[2]

PROGRESS IN RECENT YEARS

The two years which have intervened since 1948 have witnessed con-

[2] "Report on Operation of Atomic Energy Commission Towns" prepared for the Atomic Energy Commission by Lyman S. Moore with participation by J. Bion Philipson, April 20, 1948.

siderable progress toward these policy objectives. Land has been sold in fee to churches at Oak Ridge, and churches are being built by private church groups. The Oak Ridge perimeter fence, an insuperable obstacle to "normalcy," has been removed. The accounting system now furnishes comparable classified fiscal reports on housing and town operations in the three communities—an indispensable precedent to further action. Housing management and town management have been separated, at least at Oak Ridge and Richland. Oak Ridge has procured a report by outside consultants on the feasibility of incorporating the city, and Richland is in the process of doing so now. Operating costs both for housing and for the towns have been steadily and substantially reduced. It is estimated that the net cost to the federal Treasury of operating the AEC communities was $21,000,000 in fiscal year 1948. During fiscal year 1949, the first year in which the new accounting system was in operation, the net operating costs for the three AEC communities was $14,442,380; during fiscal year 1950 net operating costs are estimated to be $6,530,000, and during fiscal year 1951 it is estimated at this time that net operating costs will be reduced to $5,000,000. A policy for commercial, long-term leases has been devised at both Oak Ridge and Richland.

Concurrently, both the Appropriations Committees of the Congress and of the Joint Congressional Committee on Atomic Energy have intensified their interest in housing and town operations. The interest of the Appropriations Committees was given concrete expression in the recent move to cut in half the management fee of the Los Alamos and Oak Ridge contractors, who have direct responsibility for housing and town operation. The hearings before the Joint Committee are liberally sprinkled with inquiries on town and housing matters, including construction costs of Richland and Oak Ridge schools, water supply at Richland, the control of business enterprise at Richland, structural failures and construction costs of Los Alamos housing, and comparative costs of operation between the AEC towns and Senator Hickenlooper's home city of Cedar Rapids.[3] At the conclusion of these hearings, the majority report of the Joint Committee gave the AEC a clean bill of health on its progress toward basic goals. The majority report noted the resignation of an able AEC manager of Oak Ridge operations because he found himself preoccupied with community problems at the expense of his interest in scientific and production problems and suggested that the AEC had removed the threat of wholesale resignations and refusals to accept employment only to incur the "threat that tangled community problems will so distract and preoccupy the Commission as to divert it seriously from other responsibilities."[4] The majority report supported the policy of operating the three towns through private contractors but expressed doubts "whether adequate aggressiveness has been shown in moving toward a point where the Commission withdraws from the anomalous and distracting business of running three American communities."[5] Finally, it recommended that "a detailed plan for disengaging these towns should be drawn up and a definite timetable established for executing it."[6] Minority views of the Joint Committee were caustic about AEC progress toward major goals but were silent on housing and town management.

THE GOAL OF SELF-GOVERNMENT

Now, with substantial accomplishments behind them—important reductions in operating expense, necessary improvements in physical plant, accounting systems producing intelligible reports, the Oak Ridge community freed from the perimeter fence, an overhauling of commercial leases, increases in rents—the three communities pose still the basic problem which has confronted the AEC from the outset. Can the three communities be converted into normal towns where residential and commercial property is privately owned, where prices and rents are a function of the market, and where the citizens determine by democratic process what level of municipal service they are able and willing to support by the payment of taxes? The goal of self-government is clearly a beneficial one; it will reduce or eliminate federal subsidy and enable the Commission to concentrate on program goals without the distraction of real estate and municipal operations. The goal of self-government is further supported by what is virtually a Congressional mandate from both the Appropriations Committee and the Joint Committee. Self-government should be a goal for town residents who desire to support themselves and to experience full citizenship in a local democracy.

What questions of policy does the achievement of such a goal raise—for the Atomic Energy Commission and the citizens of the nation who have a direct stake in the progress of atomic energy, for citizens of the towns, and for Congress and the federal taxpayers it represents?

THE PROBLEM OF LOS ALAMOS

At this point it may clarify discussion to draw a sharp distinction between Oak Ridge and Hanford, both outside the security fence, and Los Alamos, which must remain behind the fence for the indefinite future. As long as Los Alamos remains behind the fence, the goal there can never be self-government and must be restricted to economical operation, reduced subsidies, and wide consultation with citizens. Because of its location, costs of operation at Los Alamos will never compare favorably with the other two towns nor with the typical American community. As long as it is behind the fence, private ownership will never be practical; and without private ownership, Los Alamos cannot enjoy local self-government. Because of these sharp differences, the remainder of this article will be limited to the questions which are common at Oak Ridge and Richland.

RENTS AND SERVICES AT RICHLAND AND OAK RIDGE

From the basic information now available to the Atomic Energy Commission and the Congress, two basic facts are clear:

1. Citizens of Richland and Oak Ridge pay shelter rents which are at least 20 per cent below prevailing shelter rents in the surrounding areas, despite an increase in the summer of 1949 of 16 per cent at Richland and 18 per cent at Oak Ridge in combined utility and rent charges. This means not only a rental subsidy to AEC town residents, but also a natural barrier to private construction of either sales or rental housing which would become the marginal housing in such a market.

2. Citizens of Richland and Oak Ridge enjoy municipal services superior in quality to those which prevail in the normal American community and at the expense of the federal taxpayer, not of the citizens them-

[3] This testimony was summarized in the *Bulletin*, V (August–September, 1949), 236–39.

[4] *Report of the Joint Committee on Atomic Energy*, 81st Cong., 1st Sess. (Washington: Government Printing Office, 1949), p. 57.

[5] *Ibid.*, p. 86.

[6] *Ibid.* This report is summarized in the *Bulletin*, V (December 1949), 333.

selves. In order to convert to private ownership and then to democratic local government, rents must be adjusted to prevailing levels. Beyond that, there are only two choices as to local taxes:

a) If the towns themselves are to be self-sufficient, citizens must either pay higher than normal taxes or reduce the quality and scope of service or adopt some reasonable combination of the two.

b) Or, if the present level of services is to be maintained and citizens are to be asked to pay no more than normal taxes, there must be a federal annual contribution comparable to the contribution in the District of Columbia, justified perhaps because of the federal industrial property located for security reasons outside the geographical limits of the town. Another justification for the annual federal contribution is the relatively low total value of real property in the towns because private capital has had little opportunity to invest freely in those industrial and commercial facilities which are an important part of the normal community's tax base. The opening of opportunities for private investment should reduce the need for a federal contribution over the years and might ultimately eliminate it. The most important barrier to private investment, aside from low rents, is the one-industry character of the towns. It should be noted that private capital has not refused to invest in other one-industry communities. However, because the one-industry risk is federally created, the federal government might consider suitable financial guarantees of minimum levels of employment as an inducement to private investment both in housing and in industrial and commercial properties.

In either case, policy questions of real magnitude are raised for the Atomic Energy Commission, for citizens of the towns, for Congress, and the taxpayer.

QUESTIONS OF POLICY FOR THE ATOMIC ENERGY COMMISSION

The Atomic Energy Commission is responsible under the law for the wise development of atomic energy to serve the best interests of the whole nation. It is a fact that town management is a necessary but unwelcome diversion of the Commission from its main task. If the Commission believes that relief from this responsibility is paramount, it must face up to these policy decisions:

1. The Commission must decide that rent and tax subsidies shall not be used to attract scientific, technical, and skilled personnel to live in Oak Ridge and Richland. It will have to decide that there is no more reason to subsidize rents and municipal services for employees at the K-25 plant in Oak Ridge than it is to do likewise for the Argonne Laboratory personnel in Chicago; that General Electric workers will be as willing to pay their way in Richland as they are in Schenectady—or, *if not*, that the answer lies in salary and wage policies and not in rents and taxes.

2. The Commission must decide that it is fully prepared, from a security standpoint, to permit the towns to develop in accordance with democratic, locally controlled plans, policies, and programs. It may well decide that no more frequent nor more serious mistakes will be made by the citizens themselves than by the AEC and the town contractors acting jointly on their behalf.

3. The Commission will have to decide that, for the immediate future, it does not need to control land use or occupancy and that, if it should, control can be re-acquired by condemnation or agreement with private owners. As a technical detail, the Commission can use its experience in Chicago to control occupancy in a limited number of privately owned units by furnishing suitable guarantees.

4. If it wants private construction of new housing, it will have to decide to establish prevailing rents as an alternative to compounding the problem still further by adding to the supply of government-owned houses.

5. It will have to recognize and establish with the Congress the need for careful timing to make all elements of the plan for conversion hang together.

QUESTIONS OF POLICY FOR CITIZENS OF THE TOWNS

Citizens of the towns vary widely in their attitudes toward private ownership and self-government. Naturally, many are well satisfied with subsidized rents and taxes, although many of these are irked by control and regulation. But, surely, scientists, who believe in freedom in all its manifestations, should be willing to accept the obligations as well as the privileges of freedom. Residents who earnestly desire to be like other American citizens with a free choice of living quarters to buy or rent and with a voice in local government will have to make these decisions:

1. They must be prepared to pay prevailing rents or to assume normal obligations for purchase payments on housing.

2. They will have to be satisfied with the scope and quality of municipal service that they themselves can afford and are willing to pay for, if they want the privilege of determining what that scope and quality are to be. This will undoubtedly require a sacrifice. They will have to remember that the average American citizen is always confronted by the necessity of rationing scarce local revenues among needed services and improvements, by the necessity of postponing less needed improvements in order to finance those which have higher priorities, and by the necessity of progressing toward, but never reaching, the satisfaction of all needs in a model community. They will find some financial compensations for these sacrifices in that they will inherit physical facilities which are practically complete and will require no bond issue to finance and pay off in years to come. But, the real compensation must come from assuming the reciprocal privileges and obligations of citizenship in a democracy. If the great ends of government are justice, internal order, welfare, freedom, and external security, as Charles Merriam, the dean of political scientists says, then these are also the great fruits of citizenship under democratic local government, and the obligations of citizenship are not too high a price to pay for these fruits.

3. Therefore, they will need to be prepared to pay local taxes in the amount necessary to support the cost of the municipal program, and they will have to decide that *democracy is worth the price.*

QUESTIONS OF POLICY FOR CONGRESS AND THE FEDERAL TAXPAYER

Congress and the federal taxpayers it represents have a genuine stake in the execution of the AEC program. Congress must recognize that solutions of these housing and town problems must be consistent with maximum progress in the development of atomic energy. Congress must decide:

1. To tolerate continued subsidies, if on a diminishing scale, even though they may continue for a period of several years. Obviously, conversion cannot conceivably be accomplished in

one fell swoop. It has taken almost four years to make the very substantial progress accomplished to date. Anyone who constructs a timetable for complete conversion (and it has been tried) will need several years to accommodate a long series of steps, many of which must be taken in sequence and cannot be taken simultaneously.

2. To tolerate continued subsidies on a diminishing scale for another reason—to give the AEC full opportunity to harmonize conversion with the realization of atomic energy goals. There must be a full opportunity to educate citizens to their new responsibilities, some of which will be painful financially, and to protect the AEC program from the unnecessary loss of skilled people, some of whom are almost irreplaceable.

3. To assume, probably, a continued financial responsibility in lump sum for a portion of local government costs without attempting to control the details of government. Normalcy is a legitimate goal for AEC towns, but subnormalcy imposed by conditions beyond the control of local residents would be tragic. A lump sum substantially less than the present net loss to the taxpayers will be a cheap price to pay indeed, to release the Atomic Energy Commission from unnecessary diversions from its all-important task, to divest the AEC of the unpleasant aspects of company town operation, and to set the level of municipal services at a point which is determined by the local pocketbook. It is not wholly unreasonable to ask if Congress would be willing to vary its contribution to the extent that the local community itself is willing to vary its payments for municipal service.

The limitations of space prevent a discussion of many important details. I have purposely omitted even a summary of the wealth of factual information as to local government costs, rents, and the like. I have also omitted any discussion of the very real technical problems involved in the sale of properties, in the encouragement of private construction, or in the actual process of municipal incorporation. These technical problems are very important and very real, but they are in essence details if Congress, the AEC, and the local citizens are united on the main goal—that citizens of Oak Ridge and Richland shall experience the conditions of local democratic life with all of its burdens and all of its satisfactions.

There is one fundamental question for Oak Ridge and Richland residents who read this journal. Is democracy worth the price?

TO SAGITTARIUS

If to a poet a physicist may speak
Freely, as though we shared a common tongue,
For "peace in our time" I should hardly seek
By means that once proved wrong.
It seems the Muscovite
Has quite a healthy, growing appetite.
We can't be safe; at least we can be right.
Some bombs may help—perhaps a bomb-proof cellar,
But surely not the Chamberlain umbrellar.

The atom now is big; the world is small.
Unfortunately, we have conquered space.
If war does come, then war will come to all,
To every distant place.
Will people have the dash
That Britons had when their world seemed to crash
Before a small man with a small mustache?
You rhyme the atoms to amuse and charm us—
Your counsel should inspire, and not disarm us.

EDWARD TELLER

In October the *Bulletin* published a poem by Sagittarius, entitled "Galluping Atom," in which this gifted contributor to the *New Statesman and Nation* expressed some British misgivings about the American readiness to use the atomic bomb. This elicited the above reply from Dr. Edward Teller, a distinguished nuclear physicist, at present associated with Los Alamos Laboratory.

Washington Notes

(*Continued from page 18*)

project." The subsequent discussion was off the record. Perhaps Gordon Dean was able to still Mr. Case's obvious qualms; the AEC got most of the requested funds. But the Appropriations Committee's disposition showed no improvement as the hearing went on.

Never in the history of its hearings before this powerful committee of the Congress has the Atomic Energy Commission been given rougher verbal treatment. It was berated for its meaningless estimates (committee members characterized them time and again as "guesswork"); it was charged with wanting "to hide behind security" ("which," said the committee chairman ironically, "is perhaps your best asset"); it was scolded for obligating funds in advance of their appropriation, in violation of the spirit of budget control laws.

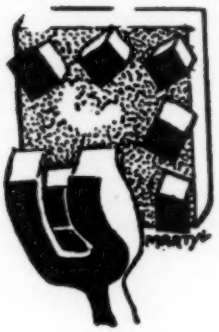
The Commission had ready answers to all these complaints. In responding to one of these, Mr. Case seemed to voice the attitude of himself and his colleagues from start to finish:

"That would probably be a little more impressive if it were not for the fact that in so many instances in dealing with the Atomic Energy Commission the Appropriations Committees have found that the Atomic Energy Commission has proceeded on the assumption it was dealing with something which was over and above the ordinary rules on appropriations. It has been said in these hearings before that no other agency of the government has been able to get by the Appropriations Committee with the lax presentation of detailed estimates that the Atomic Energy Commission has. No other agency of the government, so far as I know, has been able to come up and cloak itself with the aura of a scientific subject and get by with such general justifications . . . historically the Atomic Energy Commission has acquired the impression in the Appropriations Committee of proceeding in a different way than any other government agency did before.

"I think the Commission would be well advised—and I am leaving this committee, so it does not make any difference so far as I personally am concerned—to try to lean over backward, if possible, to get away from that feeling."

THE SCIENTISTS' ORGANIZATIONS IN 1950

THE FEDERATION OF AMERICAN SCIENTISTS



The fifth year of its life found the Federation of American Scientists struggling against a powerful tide running counter to original FAS objectives. Peaceful utilization of the results of science, international control of atomic energy, deeper and broader understanding of natural phenomena—all appeared to move away into the indeterminate future. Under the impact of national and international events, FAS found itself vainly protesting actions irrevocably taken, too often striving for an acceptable compromise rather than a desirable solution. In a year of darkening global prospects FAS fought for a brighter future as and where it could. At the year's end the future looked no brighter, and FAS was grappling with issues—mobilization of science for war and civilian atomic defense—posed by the kind of world it had sought to prevent.

ATOMIC ENERGY

Atomic affairs remained high in priority during 1950. It was the year of the announced attempt to build the H-bomb. The FAS Council, meeting shortly after the Presidential announcement, accepted the decision as inevitable under the circumstances, but urged that it be balanced by a constructive effort for peace of equal magnitude and dramatic content. It asked for new positive evidence of U.S. dedication to international control of atomic weapons and willingness to accommodate its own views to those of others in order to achieve it. The council pointed to an at least surface inconsistency in the U.S. position—its military and diplomatic reliance on its own ability freely to use the bomb while simultaneously seeking an international arrangement to preclude its use. Noting that U.S. policy on international control had been practically static through three years of impasse, the council wondered whether all possible avenues for accommodation had been explored. Alarmed by the all too apparent beginning of the predicted atomic arms race, FAS called for a review of our entire atomic policy. It asked the President to constitute a new commission for this purpose, with the broad perspective of the Acheson-Lilienthal commission, which would work toward a revision of policy which would permit at least sufficient agreement to break the deadlock.

Similar calls came from several influential sources and were sufficiently publicized and well-supported to require direct public comment by the Secretary of State and the President. Both denied the need for a new commission, indicating that American policy was constantly under study by the normal agencies of government. Ten months later the single specific policy change suggested by FAS—joint consideration of controls for atomic and conventional armaments—was incorporated by the President in his October 24 United Nations Day speech. Subsequently, Chairman W. A. Higinbotham wrote to the President commending this action and urging "that the American position remain flexible and, above all, that our representatives be prepared to exploit constructively every opportunity for building a lasting peace."

Korea brought the U.S. face to face, for the first time, with the question of when it would use the Bomb. At the beginning of the fighting, and again when the Chinese Communists entered the fray, cries arose for the use of A-bombs. The issues involved were discussed in the pages of the *Newsletter*, but as an organization, FAS made no comment. Similarly, FAS has remained silent, as have most atomic scientists, while civilian defense replaced efforts toward insuring peace as the response to the threat of atomic bombing—and the strategic and destructive potential of the bomb were re-evaluated accordingly.

SECURITY

During the year the worsening international picture increased internal tension and brought new restrictions on scientists and on the exchange of scientific information. FAS continued to oppose the extension of security measures beyond those areas where a clear danger exists of disclosing information of immediate military significance. In mid-year Congress considered and passed several bills which, although not specifically directed against scientists, are applicable to large government scientific laboratories and which were justified by their sponsors as necessary to safeguard important scientific activities. The power of summary suspension or dismissal without reference to the nature of the work engaged in, was thus given to the heads of several non-defense government agencies. Minimal, virtually ineffectual, safeguards against abuse were included in the bills.

FAS worked actively to modify these measures, alerting other organizations, and preparing analyses of the probable effects of the legislation on science and scientists. In addition, through correspondence and personal contact, FAS opinions were conveyed to members of Congress. In spite of these efforts, limited as they were by available finances and personnel, the measures were passed by Congress with little real opposition or exploration of the issues involved. Recently, FAS members in Washington have had the dubious satisfaction of seeing some of their fears realized, as at least one agency head has used his new powers to dismiss from non-security jobs individuals who had succeeded in clearing themselves of charges under the somewhat greater safeguards afforded by the President's Loyalty Program.

Security activities of the AEC continued to merit close scrutiny. In March the AEC burned its fingers

while handling an article on thermonuclear reactions. Coming soon after announcement of U.S. H-bomb intentions, the article, written by Hans Bethe for *Scientific American* and for the *Bulletin*, was understandably "hot," but even hotter were the implications of an AEC directive apparently prohibiting public discussion by AEC consultants of unclassified as well as classified information on thermonuclear reactions.[1] The FAS Council criticized this hasty gag saying, "not only that scientists have the right to speak up but that they have the duty of explanation. They need to talk, when no military security is involved, but when great decisions are made without adequate accounting to the people." The council went on to say that "These are not times in which ignorance and misinformation can be the basis of public opinion. Every thoughtlessly erected barrier between Americans and their right to know and speak is a threat to the welfare and security of the nation. We cannot fall for the easy fallacy that security lies in blind secrecy."

Through no fault of the AEC, its fellowship program became a bone of contention in 1949 when Congress insisted on requiring FBI clearance of all AEC fellows whether or not they were engaged in secret research. FAS fought this provision in Congress and endorsed the stand of the National Academy of Sciences when it refused to continue administration of the program under these conditions. During 1950 FAS sought to have the FBI-investigated fellowships limited to secret fields, twice addressing letters to the various university groups which had taken over the program from the Academy and the National Research Council. In November, however, the Oak Ridge Institute of Nuclear Studies agreed to administer the fellowships with assistance in selection by the National Research Council. The program is now stated to be only for fellows intending to seek eventual employment with the AEC.[2]

On the brighter side, the new AEC clearance procedures issued in September include almost all the improvements recommended by the FAS Scientists' Committee on Loyalty Problems. In particular, there are now procedures giving some protection not only to AEC employees but to applicants for positions as well. The procedures of several other sensitive government agencies have likewise been revised toward our Committee's recommendations, indicating that the patient work of this group has borne fruit.

[1] See editorial, "It's Not What's Said; It's Who Says It," *Bulletin*, VI (May, 1950), 130–32.

[2] See news item, p. 31 of this issue.

NATIONAL SCIENCE FOUNDATION

Passage of the National Science Foundation Act of 1950 culminated nearly five years of effort by scientists and their organizations. During most of that time the National Science Foundation has been a major item in FAS activities. Although the bill finally passed departed in important respects from FAS recommendations, the fact that it passed at all over the steadily mounting opposition must be regarded as a partial victory. An attempt to require FBI investigation and clearance of NSF fellows was beaten off by concerted action in which FAS played an important part. Important, too, were FAS efforts in obtaining a minimal appropriation ($225,000) to initiate NSF this year. Congressional opponents made a determined effort to starve out the new agency when they were unable to block its establishment. Recently, FAS addressed a letter to the new appointees to the National Science Board restating its conception of the general direction in which the Foundation might most profitably move. "We believe," said the FAS, "that the NSF in its own operating programs should concentrate its available resources on the needs of fundamental science," but "that in discharging its responsibilities as regards national science policy, the NSF should not limit itself to fundamental science but should think of science as a whole—and in relation to the society of which it is a part." The recommendation was made that the Foundation "initiate very soon a comprehensive and exhaustive study of the current utilization of our scientific resources." Included also in the letter was a recommendation, previously made to the President, of a candidate for Director of the Foundation.

SCIENTIFIC MOBILIZATION

The rapidly deteriorating international situation brought the problems of scientific mobilization for war or near-war to public attention in midsummer. An obscure, but important bill introduced in the Senate to satisfy immediate medical needs of the armed forces was suddenly broadened to render subject to draft all personnel in "professional, technical, scientific, and specialist categories." For a few days it seemed that the mechanisms for scientific mobilization would be assigned precipitously to Selective Service with no public debate. Caught without a previously formulated policy on the kind of issue which FAS had been organized to forestall, the Washington office worked to inform scientists on events, and to delay action until considered judgments could be formed. Largely because of conflicting opinions in the several government agencies concerned, and fast foot-work on the part of several key administrators, hasty action was avoided.

Since this first rumble, scientific mobilization has continued in the public eye and has occupied much of the time of top administrators of scientific activity. The Trytten, Hafstad, Barton Reports,[3] the Conant-Bush proposals, etc. have been publicized and discussed. The FAS has circulated these basic documents to its chapters and made them available on request to its members. Through the *Newsletter* and special memoranda it has sought to make clear to the scientific community the seriousness with which Washington officialdom is considering mobilization plans, and the general direction such mobilization is likely to take. To date no detailed organizational policy has been formulated.

FAS AND THE NATIONAL EMERGENCY

Meeting in Chicago in November, when the probable long continuance of extreme international tension had become apparent, the FAS Council considered and adopted an outline of general policy for the new situation. The council considered as especially important the maintenance of adequate scientific personnel and the preservation of a favorable atmosphere for effective creative scientific work. The council noted the ever present danger that long-range requirements may be sacrificed in hasty planning for critical present situations. In particular, it felt that basic science may be neglected in favor of quick application, with disastrous results in the long run. It stressed World War II experience indicating the sterility of applied science when not continuously fed by expanding basic science. It emphasized that the close interrelation of the various sciences—physical, biological, social—means that neglect of one is bound to stunt the others.

Accordingly, it urged the following: (1) Immediate implementation of the National Science Foundation Act for support of research in the basic sci-

[3] Published in the *Bulletin*, VI (December, 1950), 355, 375–80.

ences, and for financial assistance to prospective young scientists during their training period; (2) Suitable deferment policies to insure the continuance of training of at least a nucleus of future scientists, even in those fields for which an immediate practical use is not apparent; (3) Careful over-all planning—by civilian agencies—of the most effective use of all scientific and technical personnel.

Beyond these, however, the council stressed the importance of the delicate balance between individual freedoms, so important to creative science, and security measures necessary to protect the state. With this in mind the council recommended: (1) Establishment of an independent, non-partisan, Presidential commission to study the whole problem of secrecy, especially in relation to scientific research—as recommended in detail by FAS to President Truman on July 8, 1949; (2) A suitable over-all government policy on standards and procedures of personnel loyalty and security investigations; and (3) Relief from the extremes of "trial by Congressional committee" which have contributed to an atmosphere unfavorable to vigorous, uninhibited scientific research.

OTHER FAS ACTIVITIES

Space does not permit detailing the numerous activities of chapters and groups of FAS members-at-large. An active committee of the FAS chapter in Schenectady-Troy, N. Y., for instance, guides the Washington office's educational program, set up to replace on a small scale the activities of the defunct National Committee on Atomic Information. Requests for information on atomic defense for civilians predominated this year and were answered with available reprints, pamphlets, and references to materials available elsewhere. The FAS Committee on Aid to Foreign Science, staffed by the Rochester chapter, aided advanced students from abroad in obtaining fellowships and assistantships in American universities. The Committee on Biological Warfare, members of the Washington chapter, completed its report to the council.

Following its policy of promoting discussion of problems within its sphere, FAS arranged for representatives to meet informally with members of the British Atomic Scientists' Association at Oxford in September.[4] At home, FAS sponsored public meetings in New York and Chicago in conjunction with sessions of technical societies. FAS members received for their information copies of Niels Bohr's "Open Letter to the United Nations,"[5] and in addition, *Minutes to Midnight*,[6] Eugene Rabinowitch's collection of materials relating to international atomic control, was brought to their attention.

The FAS *Newsletter* which appeared ten times during the year served as an information service to members and a growing number of non-member subscribers. Besides factual news items and book reviews, it often included an interpretation of major issues from the viewpoint of the hypothetical well-informed average member. The *Newsletter* also was made available as background material to interested non-scientist organizations and the press. It is edited by the FAS Executive Secretariat in Washington.

Chairman of the Federation in 1949–50 was Hugh C. Wolfe of Cooper Union. In 1950–51 the chairman is W. A. Higinbotham, one of the active founders and former Executive Secretary of FAS. The council has seventeen members, of whom seven are directly elected representatives of members-at-large, the remainder appointed by chapters. Hugh C. Wolfe, vice-chairman, Jules Halpern, secretary-treasurer; Arthur Roberts, Gerhart Friedlander, and Clifford Grobstein serve with Higinbotham on the Executive Committee. The Washington headquarters of FAS is at 1749 L Street, N. W.

—Clifford Grobstein
—A. H. Shapley

Dr. Grobstein is a member of the FAS Executive Committee; Mr. Shapley is head of its Executive Secretariat.

THE BRITISH ATOMIC SCIENTISTS' ASSOCIATION

During the past year, the tension between East and West has been aggravated rather than diminished, and any hopes of arriving at a satisfactory system of international control of atomic energy within the foreseeable future remain extremely remote. This has meant that it has been possible for the Association to do relatively little as far as this part of its task is concerned. We feel, however, that it is of great importance to remain continually alert for any occurrence which can give rise to some hope, however slight, that negotiations might usefully be reopened.

In this connection, the Council of the Association sent a letter to the London *Times* (published on November 22, 1950) pointing out that there might be some hint of a willingness to compromise in Mr. Vishinsky's clarification of the Soviet proposals concerning inspection in his speech to the United Nations General Assembly on October 23.[7] We felt that this, together with President Truman's proposal to link conventional with atomic weapons,[8] might possibly form the bases of renewed discussions.

Still within the same general context of international control, we also feel that it is necessary to be prepared in case there should be any sudden easing of the international situation. We think that it is important to keep under review the various schemes which have been put forward and to see if it is possible to suggest any compromise which might be acceptable to both sides.

Professor Peierls, writing a year ago upon the activities of the Association, mentioned that we were discussing the procedure that has been set up for dealing with Communists (and other political extremists) in the Scientific Civil Service. This discussion culminated in the publication by the Association of a statement[9] stressing the dangers of any development or extension of any system of discrimination on political grounds into fields where it was not absolutely vital to national security.

The educational side of our activities has continued largely through the medium of lectures at branch meetings and to interested organizations. Two important conferences have been held under the auspices of the Association in the course of the year. In May, the Birmingham branch, in collaboration with the extra-mural department of

[4] This meeting was reported in *Bulletin, VI* (November, 1950), 350.

[5] Published in *Bulletin*, VI (July, 1950), 213–17.

[6] A history of the control negotiations in the United Nations. Published by the *Bulletin of the Atomic Scientists* (Chicago: 53 W. Jackson Blvd., 1950). Price $1.00.

[7] Printed in the *Bulletin*, VI (December, 1950), 369–70.

[8] See *ibid.* (November, 1950), 343.

[9] See *ibid.* (June, 1950), 185.

Birmingham University, held a two-day conference on the use of radioactive isotopes in industry. There has possibly been some tendency to overlook the industrial applications of radioisotopes in comparison with the rather more spectacular biological ones. This conference stimulated a considerable interest among a number of industrial concerns and it is hoped that it may have helped to bring to their attention some of the possibilities of the new techniques. The second conference was held in London in October, in collaboration with the Institute of Biology and the British Association for the Advancement of Science. It was concerned with the biological hazards of nuclear radiations. Both conferences were very well attended and were highly successful.

An important aspect of the Association's activities is the publication of our journal, the *Atomic Scientists News*. This is a very modest affair in comparison with the *Bulletin of the Atomic Scientists*, but it serves as a useful channel through which the views of individual members can be expressed and our members generally kept informed on recent developments. For example, a special number of the *News* was issued, dealing with different reactions to the question of the hydrogen bomb. This illustrated very well the fact also mentioned by Professor Peierls in his earlier article, namely that on many pressing questions connected with atomic energy, the Association as a whole cannot pronounce an opinion, since its members are divided in their political views. On the question of the hydrogen bomb, the contributors differed widely in their approach, from concurrence, however reluctant, in the United States' decision to develop the bomb, to the belief that it is immoral to work upon the bomb in any circumstances. All, however, were unanimous in showing a profound sense of the overwhelming destructiveness of the bomb and the need to achieve political concord before it is too late.

The work of presenting a balanced account of the changing political and technical situation in atomic energy to the citizens of our country is of great importance, and atomic scientists have a social responsibility to see that it is done effectively. At present our Association meets the need to only a limited extent. In particular, we feel that there are too few full members. A larger membership is needed to make the Association more fully representative and to develop local branch activities. We are therefore taking steps to endeavor to increase our membership.

Finally, reference must be made to an informal two-day meeting which was held in Oxford in September to exchange views with some members of the Federation of American Scientists. This was considered by our delegates to have been a most useful and stimulating discussion which has led to a considerable clarification of our ideas.

—J. L. MICHIELS
Hon. General Secretary

THE NEW YORK COMMITTEE ON ATOMIC INFORMATION

The New York Committee on Atomic Information, Inc., was established in 1948 to create an awareness on the part of the people of the City of New York that atomic energy is their business and that this new discovery, used either in war or in peace, will affect the personal lives of the present generation and generations to come.

Through the efforts of a limited number of interested citizens in New York City, the following has been achieved to date:

1. *Exhibit on Atomic Energy.*—The Committee initiated and contributed to the atomic energy exhibit held at the Grand Central Palace in New York City in connection with New York's centennial celebration.

2. *Religious and Welfare Committee.*—Through its religious and welfare subcommittee under the leadership of its chairman, Dr. L. Cornelius Longarzo, representatives from the three major faiths, and from the metropolitan colleges and universities have been brought together in exploratory meetings devoted to a study of the ethical, social, and educational implications of atomic energy. Fifteen meetings have been held to date; the four which were held in 1950 treated the following subjects:

a) Secrecy and security in science
b) Congressional and political controls of atomic energy
c) Implications of atomic energy in history, ethics, and philosophy
d) Ethical and military aspects of atomic energy

Four similar meetings are scheduled for the 1951 season, which will cover, respectively, the historical, philosophical, ethical, and international effects and implications of atomic energy.

3. *Legal Committee.*—The legal subcommittee under the chairmanship of Maurice P. Davidson, former Commissioner of Gas, Electricity, and Water Supply for the City of New York, has concluded four exploratory meetings devoted to the study of the Atomic Energy Act. As a result of these meetings, the following four papers are available for public distribution:

a) "Procedures under Licensing and Patent Provisions of the Atomic Energy Act" by Judge Eugene R. Canudo
b) "The Atomic Energy Act: Contracts and Contractors" by Louis A. Kass, Esq.
c) "Atomic Energy and Patent Laws" by Theodore Haffner, Esq.
d) "International Aspects of Atomic Energy" by Hon. Maurice P. Davidson

4. *Distribution of Reports.* — The minutes of the religious and welfare committee and the papers prepared by the legal committee have been distributed, on request, to colleges, universities, and libraries throughout the United States and to South America and Scotland. A list of these papers and their cost may be obtained by writing to the Committee at 39 Broadway, New York City.

5. *Civil Defense.*—The NYCAI has kept abreast with the national and local activities on civil defense. It has maintained close liaison with the Civilian Protection Group, headed by S. A. Anthony, Jr., who has made regular reports of his group's activities to the Board of Directors of the NYCAI. Both Mr. Anthony and Murray S. Levine, chairman of the NYCAI testified as private citizens before the Joint Congressional Committee on Atomic Energy at their civil defense hearings in March, 1950.

6. *Medical Committee.*—The formation of a medical committee is now in progress under the chairmanship of Dr. George C. Escher of the Memorial Hospital in New York City. This committee will serve two purposes:

a) To sponsor annual meetings of various hospitals, laboratories, and individuals now engaged in research with

atomic energy by-products in the New York Area; and

b) To gather and disseminate information to the general public on the progress of the use of radioactive by-products in research and therapy in the medical field.

7. *Security.* — Precautionary measures have been taken with the local Atomic Energy Commission officers to check all information released to the public in order to conform with policies of national security. Also, steps have been taken to screen members and sponsors of the NYCAI.

8. *Speakers Bureau.*—Through this subcommittee under the guidance of Murray S. Levine, chairman, over 250 individual lectures and forum programs have been arranged in New York City and surrounding territory since the formation of the NYCAI. This included an atomic energy week sponsored by the Mayor of the City of Newark, New Jersey, where continuous programs were held for a full week at the City Hall and at Civic Groups, Elementary High Schools, and Colleges.

For the coming year, the following officers have been chosen: Murray S. Levine, Chairman; Hugh C. Wolfe and Harry Lewis, Vice Chairmen; Maurice P. Davidson, Treasurer; Max Spitalny, Secretary. The additional directors are: S. A. Anthony, Jr., Dr. L. C. Longarzo, Professor Robert Morisey, Judge Eugene R. Canudo, Mrs. Mildred V. D. Mathews, Herman Jaffe, and Arthur F. Van Dyck.

—Murray S. Levine
Chairman, NYCAI

THE COUNCIL ON ATOMIC IMPLICATIONS

During 1950 the Council on Atomic Implications, Inc.—a non-profit educational corporation located at the University of Southern California—continued a five-point program. Representative highlights in each of the areas covered by the program are as follows:

1. *Expansion of research and reference resources.*—From a wide variety of sources came magazine articles, reprints, speeches, pamphlets, press releases, monographs, radio scripts, government publications, photographs, books, filmstrips, bibliographies, newspaper clippings, films records, and transcriptions.

2. *University level activities.* — Weekly film showings and a weekly lecture were held.

3. *Community level.*—A Council speaker presented a program on atomic energy and education to four school workships in which over six hundred teachers were enrolled. A series of four programs was presented several times through city or county adult education departments. Films or speakers were supplied to many other groups.

4. *National level.*—Educational material was sold or information supplied to corporations, school systems, government officials, universities, individual citizens, and libraries in over thirty-five states and in such countries as Sweden and Siam.

5. Efforts by the Council resulted in the production by others of three films on atomic energy, one of which received national theatrical release. Two new C.A.I. publications were prepared —"Suggested Outlines for Educational Films on Atomic Energy" and "The Atom Enters the Social Structure—A Survey."

—Albert Gotlieb
Executive Secretary

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UNITED NATIONS ATOMIC ENERGY NEWS

THE EIGHT-POWER RESOLUTION

THE subject of the international control of atomic energy was brought to the attention of the Fifth General Assembly on December 13 and 14, when a two-day debate accompanied the adoption of an eight-power resolution carrying forward President Truman's suggestion that conventional and atomic weapons be considered in a joint disarmament commission.[1] By a vote of 47 to 5 (the Soviet bloc) with 3 abstentions (Yugoslavia, Indonesia, and Pakistan) the Assembly adopted the following resolution proposed by Australia, Canada, Ecuador, France, Netherlands, Turkey, United Kingdom, and the United States:

The General Assembly . . .

Decides to establish a committee of twelve, consisting of representatives of the members of the Security Council as of 1 January 1951, together with Canada, to consider and report to the next regular session of the General Assembly on ways and means whereby the work of the Atomic Energy Commission and the Commission for Conventional Armaments may be coordinated and on the advisability of their functions being merged and placed under a new and consolidated disarmament commission.

THE SOVIET COUNTERPROPOSAL

Another proposal, sponsored by the USSR (Doc. A/1676)—which would have instructed the Atomic Energy Commission to resume its work in order to take up immediately the preparation of draft conventions for the "unconditional prohibition" of the atomic weapon and for the international control of atomic energy, with a view to both conventions being concluded and carried into effect simultaneously after submission to the Security Council not later than 1 June 1951—was defeated by 5 in favor to 32 against, with 16 abstentions.

[1] This suggestion was made in the President's United Nations Day speech at Lake Success on October 24. See *Bulletin*, VI (November, 1950), 343.

MR. VISHINSKY'S SPEECH

After the introduction of the eight-power resolution by SIR KEITH OFFICER (Australia), the Assembly listened to MR. VISHINSKY speak on the Soviet counterproposal for an hour and forty minutes. Mr. Vishinsky dismissed the eight-power proposal as an attempt to dodge the control issue—to "pigeonhole it—a magnificent piece of skullduggery which would see to it that we would not make any progress in the prohibition of the atomic weapon. . . . It is to give a bone to this General Assembly. Let the General Assembly keep licking that bone, which does not even have a piece of flesh on it, or the shadow or hint of flesh on it.[2] Keep licking that bone for a year. Elaborate a convention on the prohibition of the atomic weapon? Elaborate a convention on the establishment of international control? No, this is not the time. Let us not touch that with a ten-foot pole either. That is the gist of the draft resolution which is handed up by the octet."

Vishinsky accused the United States of thwarting any attempt at prohibiting the atomic weapon from the beginning of the negotiations in 1946 because "the production of weapons is wrapped in tremendous profits" for "the monopolists" and because "the bosses of the U.S. monopolies, such as the Morgan, Du Pont, Mellon, and Rockefeller outfits" wish to "block the utilization of atomic energy for peaceful ends—as the only means of maintaining their fictitious advantages." He went to considerable pains to "prove" that every American—from Conant and Compton to Osborn and Lilienthal—who had had anything to do with the production or control of atomic energy is somehow linked to the Morgans, the Rockefellers, the Mellons, or the Du Ponts.

The Majority Plan he characterized again as a plot to extend American monopoly to all the atomic energy resources of the world, and he reiterated the Soviet's unwillingness to "sacrifice sovereignty . . . for the profits of American monopolies."

Vishinsky charged the United States with a willingness to use the bomb to "guarantee the successful consummation of their aggressive plans," referred to "the weakling answers of the President of the United States at the press conference of 1 December . . . as to the possible utilization of the atomic bomb by MacArthur" which, he said, "shows that the ruling circles of the United States of America are prepared at any proper or convenient moment to use the atomic bomb. He added that the United Kingdom, France, and Belgium were "now preparing apace to throw atomic bombs on the heads of Asiatics. First of all the atomic bomb will be expended on the expendable Asiatic peoples."

He ended his appeal for the immediate preparation of conventions on prohibition and control by citing the success of the Stockholm Appeal and the actions of the Partisans of Peace and demanding that the Assembly heed the "mighty voice of millions who demand the prohibition of the atomic weapon."

[2] It will be remembered that in the past it was the Soviet Union which had repeatedly urged that conventional and atomic weapons be considered together. Now such a proposal appears to have lost its attractions.

REPLIES TO VISHINSKY'S ARGUMENT

MR. JOHN SHERMAN COOPER (USA) replying to Mr. Vishinsky, said that "our economic system" had nothing to do with the failure to reach agreement in the field of disarmament or atomic

energy control. "What is needed is that the peoples of the world should seek the establishment of a world community which is characterized by openness in their relations . . . without barriers to the free movement of peoples and exchange of information and ideas." He pointed out that no atom bomb had been dropped on Korea but that "the instruments of aggression had been those of great masses of men, and of conventional weapons and tanks, as well as other new weapons of war, which are held in great quantity by the Soviet Union."

SIR GLADWYN JEBB'S REMARKS

A further answer to Mr. Vishinsky came in the speech given by SIR GLADWYN JEBB (United Kingdom) in support of the eight-power resolution. "It is very easy," he said "to coin slogans such as 'Ban the atomic bomb.' But what value can we attach to Soviet assurances about their peaceful intentions and their desire to reach agreement on atomic energy so long as they reject the only plan which has yet been worked out for effective control of atomic energy and effective prohibition of atomic weapons?" . . . The Soviet proposals were found to be inadequate when they were first proposed in 1946 and 1947, and although they have been examined and re-examined since then, they are still found wanting. "It is really no good, Mr. Vishinsky—repeating what he has said time after time—that it is all the fault of the American monopolists . . . the only cure Mr. Vishinsky can suggest for our ills is that the American system of free enterprise should be replaced by a system in which the American economy, I suppose, is centrally controlled by a small body of men who are replaced at intervals by purges resulting in a series of judicial assassinations."

Sir Gladwyn wanted to know "how many more mountains have been moved by the Soviet government since Mr. Vishinsky made the same speech last year?" Mr. Vishinsky, he added, had said nothing about this "and this seemed to indicate that such small amounts of uranium as the Soviet government has been able to extort from Germany and Czechoslovakia have been put to quite a different purpose." He observed that Vishinsky had "sought to insinuate that the atom bomb was being constructed in the United States only for use against Asian peoples, by which presumably he meant peoples of Asia other than those in the Soviet Union. It is quite evident why this malicious suggestion has been made, and that is to embroil the Western with the Asian peoples, and particularly to cause alarm and despondency in Peiping."

Sir Gladwyn warned against a plan which would depend for its execution entirely on the good faith of the nations concerned and not on any watertight system of international control. He said he could well imagine that if we agreed to any plan for the immediate prohibition of atomic weapons and the destruction of existing stockpiles without the certain knowledge that the Soviet Union would do likewise that Stalin would say, as Hitler did after the conclusion of the Soviet-German pact, "Now I have the world in my grasp."

He then declared that the United Kingdom stood ready at all times to undertake further negotiations if there was even the smallest chance for a settlement. The joint resolution, in his opinion, afforded such a chance.

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NEWS IN BRIEF

Prepared by PETER AXEL

Many of the news items reported below are discussed in this issue by Anne Wilson Marks in her Washington Notes. The information is presented in this section as a convenient tabulation of factual material.

USE OF A-BOMB IN KOREA

In his press conference of November 30, President Truman made some remarks which were interpreted, for several hours, as an indication that the use of the A-bomb in Korea was imminent. Although this erroneous impression was corrected, the "A-bomb press conference" triggered a general discussion of the use of atomic weapons. England, France, and Canada expressed strong opposition to this action. Soon after the corrected story was available, the French Foreign Office released a statement to the effect that "the Korean objectives are not important enough to justify the use of the atomic bomb." The Canadian Minister of External Affairs, Lester B. Pearson, said on December 4: "Everything possible must be done to prevent the war in Korea from becoming a war against China. Such a development would mean that the forces of the Western nations would be inevitably drawn into the trap laid for them and their most dangerous front in Western Europe would be left exposed."

Britain's Prime Minister, Clement Attlee, hurriedly scheduled a conference with President Truman. The communique, issued on December 8 after a week-long series of talks, showed that the United States did not intend to abandon the defense of Western Europe. The statement also emphasized the unity of purpose and the agreement which existed between the United States and the United Kingdom. Recognizing that the use of the A-bomb would initiate a third world war, the United States promised to inform the British if world conditions changed sufficiently to warrant serious consideration of the use of atomic weapons. This concession by the U.S. was much weaker than the Quebec agreement in World War II, which gave Britain and Canada the right to veto any decision to drop the bomb. However, Mr. Attlee seemed satisfied and asked the House of Commons, on December 12, to accept his assurance that there was no difference of opinion between Britain and the U.S. "on this vital matter."

The Asiatic reaction, while differently motivated, was also violently opposed to the use of the A-bomb. On December 3, *New York Herald Tribune* correspondent A. T. Steele reported: "Comment is uniformly unfavorable and in some cases bitingly so. . . . If the President had made it clear that the bomb, if used at all, would be used only against military targets, the reaction might have been less critical. In Asian minds the atomic bomb is invariably associated with mass destruction of civilian populations as at Hiroshima and Nagasaki."

The spectrum of domestic opinion on the use of the A-bomb was well represented in the United States Senate. Opposing its use was Senator Young; Senator Lehman and Millikan advocated caution and suggested that only the most urgent needs of self-preservation should be allowed to force the use of the weapon. Senator Taft opposed its use in China, preferring to save the A-bomb for a possible third world war. Senator Flanders proposed that only the U.N. General Assembly should be empowered to authorize atomic bombing. Most of the senators did not make any statement; some made noncommittal remarks, such as Senator Maybank's, to the effect that the use of the A-bomb should be considered. The largest vocal group wanted to turn the weapon over to U.N. military forces; some suggested that a U.N. ultimatum be issued before any bombs were dropped. This group included: Senators O'Mahoney, Cain, Brewster, Pepper, Hickenlooper, Edwin Johnson, and Douglas. Senator Morse actually called for the use of the A-bomb against Russia unless a settlement could be reached with the Russians "within the next few days."

From the military point of view, the lack of any suitable A-bomb targets in Korea was attested to by General J. Lawton Collins, U.S. Army Chief of Staff, during an interview in Seoul on December 6.

One amusing suggestion was given by Representative Plumley of Vermont, who wanted "to authorize General MacArthur, at his discretion, to use the A-bomb to stop Chinese infiltration in Korea."

AEC EXPANSION

When President Truman requested an additional 17.8 billion-dollar defense appropriation on December 1, he included 1.05 billion for the AEC. The AEC had already received regular and supplemental appropriations for the current fiscal year of about 0.9 billion in cash and 0.3 billion in contract authorizations. If the new request is granted, the AEC budget for the current year will be about equal to the total wartime expenditure on atomic energy.

One new set of production plants for which $260,000,000 has already been appropriated will be located on 250,000 acres of land in Aiken and Barnwell counties, South Carolina. The plants will be designed, built, and operated by the Du Pont Company of Wilmington, Delaware.

Although the exact purpose of the new facilities was not announced in the AEC press release of November 28, previously released information indicates that plutonium and, if desirable, tritium will be manufactured. The Works Manager of the Operating Plant will be Don A. Miller of Du Pont. Curtis A. Nelson is manager of the new AEC operations office for this project.

Another new set of production facilities, for separating U-235 by gaseous diffusion, will be located at the Kentucky Ordnance Works, near Paducah, Kentucky. This project will require about half of the recent supplemental billion-dollar request. The other half of the appropriation is slated for use in acquiring uranium ore and increasing weapons production and storage facilities. The new U-235 plant will be operated by the Carbide and Carbon Chemicals Division of the Union Carbide and Carbon Corporation, which now operates Oak Ridge. The project will be under the direction of R. W. Cook, the present manager of the Commission's Oak Ridge Operations Office. A Kentucky area office will be established at the site.

MOBILIZATION

A plan for universal military service and training was proposed by the Association of American Universities in a

resolution published on December 7. The plan calls for a two-year training period for all boys to begin when they reach the age of 18. The proposal does not include any deferments but suggests several special training programs as options for potential specialists. The resolution was adopted after the Association had studied the report of a committee of the following seven college presidents: Gordon Gray, North Carolina, chairman; John E. W. Sterling, Stanford; D. W. Bronk, Johns Hopkins; Henry W. Wriston, Brown; Arthur H. Compton, Washington University (St. Louis); Lee A. DuBridge, California Institute of Technology; and Colgate W. Darden, Jr., Virginia.

A similar proposal, for two years of military service, including training, was made by "The Committee on the Present Danger" on December 12. This committee consisted of twenty-five prominent Americans, including James B. Conant, president of Harvard University, and Dr. Vannevar Bush, wartime head of the Office of Scientific Research and Development.

New York's Governor Thomas E. Dewey, on December 14, called for mobilization for defense and proposed a two-year universal military service program.

NATIONAL SCIENCE FOUNDATION

Dr. James B. Conant, president of Harvard University, was elected chairman of the National Science Board of the National Science Foundation at a White House meeting on December 12.

Other officers elected by the 24-man board were Edwin B. Fred, president of the University of Wisconsin, as vice chairman, and these additional members of the executive committee:

Chester I. Barnard, president of the Rockefeller Foundation; Detlev W. Bronk, president of Johns Hopkins University; Lee A. DuBridge, president of the California Institute of Technology; Dr. Paul M. Gross, dean of the Duke University graduate school; Robert F. Loeb, Bard professor of medical services, College of Physicians and Surgeons, Columbia University; Joseph C. Morris, vice president of Tulane University; and Elvin C. Stakman, chief of the division of plant pathology and botany, University of Minnesota.

The board, governing body of the National Science Foundation, will meet again January 3 to consider and recommend a Foundation director to President Truman who will make the appointment after the January meeting.

DECLASSIFICATION

The United States, United Kingdom, and Canada modified their security restrictions on information concerning low-power nuclear research reactors. The United States reactors on which design and operation information will be considered for declassification are:

1) The world's first nuclear reactor, constructed from uranium and graphite under the West Stands of the University of Chicago's Stagg Field in 1942 and subsequently dismantled;

2) A modified version of the West Stands reactor located at the Palos Park site of the Argonne National Laboratory;

3) A uranium and heavy water reactor at the DuPage County site of Argonne National Laboratory; and

4) A "homogeneous" enriched uranium, light water reactor located at Los Alamos.

These reactors are all fairly old, and the information which is now released has undoubtedly been available to the Russians by virtue of the work they must have done before producing their own A-bomb.

AEC FELLOWSHIP PROGRAM

The Oak Ridge Institute of Nuclear Studies will be the nation-wide administrator of the Atomic Energy Commission's predoctoral and postdoctoral fellowship programs for the 1951–52 academic year. The tentative maximum number of fellowships will be awarded as follows: 150 predoctoral and 30 postdoctoral fellowships in the physical sciences; 100 predoctoral and 45 postdoctoral fellowships in the biological and medical sciences. The predoctoral fellowships in the physical sciences are restricted to students who have had one year of graduate training. The basic stipends will be $1,600 for predoctoral fellows and $3,000 a year for postdoctoral fellows. Fellows will receive $500 additional allowance if married plus $250 for each child not exceeding two. Allowances will also be made for travel to the site of work and for tuition. The fellows must be citizens of the United States and must be approved as to loyalty after investigation by the FBI. It was after the requirement of FBI investigation was introduced in August 1949, that the National Research Council stopped administering the predoctoral fellowship program; last year, four regional AEC boards were created to select the fellows.

Applications for fellowships in the medical sciences are due on January 15, 1951; all other applications must be received by February 15, 1951.

The AEC, on November 19, 1950, announced the selection of 40 graduate students who are now receiving training under its special fellowship program in radiological physics. The University of Rochester and Vanderbilt University are providing the training.

URANIUM PROCUREMENT

Uranium to be produced in the Union of South Africa as a by-product of gold production will be sold to the United States and the United Kingdom under an agreement just concluded by the three nations. The AEC announcement on December 14 indicated that the South African gold ores are one of the world's largest sources of uranium even though the percentage of uranium content is low. No details were given on production rates or ore quality.

The AEC also attempted to stimulate U.S. uranium prospecting and mining development by lowering the minimum grade of development ore that will be accepted from producers in Marysvale, Utah. The ore may now contain as little as 0.1 per cent uranium oxide provided that it averages 0.15 per cent. Before October 23, 1950, the minimum figure was 0.2 per cent, and the average had to be 0.3 per cent. Once the low-grade surfaces ores are removed, it is hoped that richer ore deposits will be found at greater depths. As an additional incentive, the guaranteed price of $2.50 per pound of contained uranium oxide has been extended to March 31, 1958.

RADIOLOGICAL MONITORING INSTRUMENTS

On December 11, the Federal Civil Defense Administration announced its recommendation of two basic types of radiation monitoring equipment. The instruments differ mainly in their maximum range; the low intensity long-range survey instrument will have a 500 milliroentgen per hour range, while a much higher intensity instrument (500 roentgens per hour) is proposed for area survey operations following an atomic attack. The selection of these particular instruments was made by a special civil defense radiological committee which included representatives of the AEC, the Armed Forces Special Weapons Project of the Department of Defense, the U.S. Public Health Service, the Bureau of Standards, and the Federal Civil Defense Administration.

This committee pointed out the need

for the development of a high intensity instrument; low intensity equipment is available and can easily be redesigned to comply with the specifications, which are available from the FCDA. One section of the specifications concerns the durability, dependability, and ruggedness of the equipment. These requirements have been patterned after well-established Army-Navy procurement specifications and should prove very satisfactory. Unfortunately, the special problems involved in radiation monitoring have not yet been solved as satisfactorily. The specifications for the high intensity instrument afford inadequate protection for the user of the instrument; it will presumably be carried in the hand and be viewed from three feet. With the presently accepted tolerance doses for human beings, it will probably be necessary to provide instruments which can be operated at much greater distances.

APPOINTMENTS

Dr. Philip N. Powers, personnel adviser to the AEC, joined the NSRB on December 3. His job will be to advise the President on the utilization of scientific personnel during limited and total mobilization.

J. D. Anderson was appointed manager of the AEC operations office in Schenectady on November 29.

Dr. H. A. Spoehr, plant physiologist, has been appointed consultant to the State Department to help implement the program outlined in the Berkner Report (see *Bulletin*, October 1950, pp. 293–98).

QUOTES

President Truman (Address to U.N. General Assembly on October 26):

"Nevertheless, these years of effort have served to bring to the attention of all nations the three basic principles upon which any successful plans of disarmament must rest. First the plan must include all kinds of weapons. . . . The conflict in Korea bears tragic witness to the fact that aggression, whatever the weapons used, brings frightful destruction. Second, the plan must be based on unanimous agreement. . . . Third, the plan must be foolproof. Disarmament must be based on safeguards which will insure the compliance of all nations."

Gordon E. Dean (Chairman AEC, in an interview in *U.S. News and World Report*, November 3):

"We would be kidding people if we told them that weapons now in our arsenal have the energy release of a Hiroshima or Nagasaki-type bomb. They don't. The energy releases are greater, but your area of damage goes up by the two-thirds power rule, so that the area of damage is not so much larger. So I think that for all practical purposes, for civilian defense planning and everything else, you can start with the Nagasaki and Hiroshima bomb."

Senator Millard E. Tydings (Speech in Chestertown, Maryland, October 14):

"I hear all the secret information on atomic weapons. Since the first atomic bombs were dropped on Hiroshima and Nagasaki, scientists have been working on enlarging the decisive factor of this weapon, and the bomb of today would be many times as devastating and would cover a far wider area than those dropped in World War II."

Dr. James R. Killian, Jr. (president, Massachusetts Institute of Technology, speaking in the Bates College Chapel in Lewiston, Maine, November 4, 1950):

"Yet within and without our universities scientific advances are being curtailed by too much secrecy. . . . I do believe that we can achieve a better balance between secrecy and free exchange of information."

Gordon Dean (*U.S. News and World Report*, November 3):

"Possibly 8 to 10 per cent of our effects are expended on what you might label 'peacetime uses'; that would be your isotope programs and things of that kind and straight research. On the other hand, 18 to 20 per cent goes to fabrication of weapons and all the Los Alamos weapons-development portion of our budget. In between these two is an area of 70 per cent or a little over which makes up the capital investment and operating cost for the piles at Hanford and the gaseous diffusion plant at Oak Ridge. Now the output of these facilities can go either way. You can take this metal and you can put it into reactors as fuel and eventually make power from it, or you can take this metal and make it into bombs. Now, actually, what we do today is to make it into bombs. The heat goes to waste in our present reactors. They weren't designed for making electric power. They were designed to produce plutonium and nothing else. Now, I would say in all candor, after I have made this original qualification, that the major effort today is in getting atomic raw material into weapons and getting these weapons fast. Some day it may be possible for us to take those nuclear components out of the weapons—they don't deteriorate—refabricate them into fuel elements for power piles, and we've got something much more valuable than the gold at Fort Knox."

General Mark Clark (before Executives Club in Chicago, November 10):

"The ballyhoo of super-duper secret U.S. weapons is completely incorrect." [General Clark went on to say that the only new weapon is the 5.3 bazooka].

Kent Hunter (*New York Journal American*, Washington Bureau, in an "authoritative and exclusive" article on September 24, 1950):

"With her offensive atom war plans completed, Russia's current activity is the perfection of cosmic ray anti-aircraft defense."

D. H. Kimball, Undersecretary of the Department of the Navy, and *Gordon Dean*, Chairman of the U. S. Atomic Energy Commission (in a recent Joint Statement):

"One very essential condition for maintaining our national strength, whether for peace or for war, is that the research in the sciences which is basic to all technological progress be kept at a high level. Such research is now in progress in many universities, private research establishments, and other laboratories throughout the nation. By this research we add to our store of scientific knowledge and increase the number of highly trained persons available to the nation in time of need. The scientist in his laboratory and the research professor with his graduate students are performing a service which may make a critical difference to our country in the difficult years ahead.

"In particular, the Department of the Navy and the Atomic Energy Commission consider a high level of basic research in the sciences essential to the continued progress of their respective programs."

TO OUR READERS

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